IGU**moscow**2015

# Book of Abstracts


- COMMISSION AND TASK FORCE SESSIONS
- JOINT SESSIONS
- THEMATIC SESSIONS
- SPECIAL SESSIONS
- LECTURES OF INVITED SPEAKERS


Interactive menu

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Russian Academy of Sciences

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## 1. COMMISSION AND TASK FORCE SESSIONS

**Sessions are listed following the order of commissions' number**

**C12.03 Biogeography And Biodiversity**

Response of Mountain Ecosystems to Climate Change

Biogeography and Conservation of Biodiversity 1

Biogeography and Conservation of Biodiversity 2

Biogeography and Conservation of Biodiversity 3

Biogeography and Conservation of Biodiversity 4

Biogeography and Conservation of Biodiversity 5

**C12.06 Cold Region Environments**

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Cold Regions: Monitoring, Observing, Understanding 1

Cold Regions: Monitoring, Observing, Understanding 2

Cold Regions: Monitoring, Observing, Understanding 3

Cold Regions: Monitoring, Observing, Understanding 4

Cold Regions: Monitoring, Observing, Understanding 5

Cold Regions: Monitoring, Observing, Understanding 6

**C12.07 Cultural Approach in Geography**

Global Sustainability and Global Understanding

Performing Places, Culture and Nature in Different Social and Geographic Settings 1

Performing Places, Culture and Nature in Different Social and Geographic Settings 2



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**C12.09 Environment Evolution**

Climate - Vegetation Interaction under Current and Future Climate Change Scenarios 1

Climate - Vegetation Interaction under Current and Future Climate Change Scenarios 2

Climate - Vegetation Interaction under Current and Future Climate Change Scenarios 3

Environment Evolution and Human Activity in the Late Quaternary 1

Environment Evolution and Human Activity in the Late Quaternary 2

Environment Evolution and Human Activity in the Late Quaternary 3

Landscape Dynamics and Human Impacts During the Last Millennium 1

Landscape Dynamics and Human Impacts During the Last Millennium 2

Landscape Dynamics and Human Impacts During the Last Millennium 3

Landscape Dynamics and Human Impacts During the Last Millennium 4

Landscape Dynamics and Human Impacts During the Last Millennium 5

Landscape Dynamics and Human Impacts During the Last Millennium 6

**C12.10 Gender and Geography**

Gendered Crime and Spaces: an Approach in Feminist Geography

Gendered Life-Courses

Factors Affecting Women's Education: Gender, Space, Culture and Society



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## C12.11 Geographical Education

Geography Teacher Education 1
Geography Teacher Education 2
Geography Teacher Education 3
Geospatial Technologies in Geographical Education 1
Geospatial Technologies in Geographical Education 2
Geospatial Technologies in Geographical Education 3
Geospatial Technologies in Geographical Education 4
Integrated School Discipline and Geography 1
Integrated School Discipline and Geography 2
National and International Assesment
National Curricula and International Standards 1
National Curricula and International Standards 2
Empirical and Classroom Research 1
Empirical and Classroom Research 2
International Links and Innovations 1
International Links and Innovations 2

## C12.12 Geographical Information Science

Gis Or Information Systems: The Boundary between Basic and Applied Research 1
Gis Or Information Systems: The Boundary between Basic and Applied Research 2
Gis Or Information Systems: The Boundary between Basic and Applied Research 3
Giscience and Geography Education: From Learning and Discovery to Science



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**C12.13 Geography of Governance**

Development, Spatial Planning, and Governance. 1 National, Regional and Urban Levels

Development, Spatial Planning, and Governance. 2 Cities, City Regions Governance and Planning

Development, Spatial Planning, and Governance. 3 Urban Expansion

Development, Spatial Planning, and Governance. 4 Regional Development and Spatial Planning

Governance between Theory and Praxis - Multilevel and Network Governance in Spatial Perspective. Spatial Governance: New Problems and Approaches

Governance, Government And Development In Rural And Peripheral Environment. 1 The Level Of Community

Governance, Government and Development in Rural and Peripheral Environment. 2 Environmental Governance and Development

**C12.14 Geography of the Global Information Society**

Information Society and Quality of Life

ICTs Diffusion in Space

**C12.15 Geography of Tourism, Leisure, and Global Change**

Tourism and Regional Development. 1 South African Experiences

Tourism and Regional Development. 2 Cultural Dimensions

Tourism and Regional Development. 3 Rural Issues

Tourism and Regional Development. 4 Host and Guests

Tourism and Regional Development. 5 Planning and Impacts

Tourism and Regional Development. 6 Business Perspectives

Tourism and Crisis

Tourism, Mobility and Information

Tourism and Environment 1: Protected Areas

Tourism and Environment 2: Sustainability

Tourism and Environment 3: Challenges

Tourism Geographies

Geographies of Polar Tourism

Urban Tourism



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**C12.16 Geoparks**

Geoparks and Geoheritage 1

Geoparks and Geoheritage 2

**C12.17 Global Change and Human Mobility (Globility)**

People on the Move: the Persective of the Life Cycle and the Role of Gender

Real and Virtual Borders: the Challenge of Human Mobility

Responses to Displacement from Asia Pacific

**C12.18 Hazard and Risk**

Anthropogenic Influence on Natural Hazards and Risks 1

Anthropogenic Influence on Natural Hazards and Risks 2

Anthropogenic Influence on Natural Hazards and Risks 3

Anthropogenic Influence on Natural Hazards and Risks 4

Disaster and Resilience 1

Disaster and Resilience 2

Disaster and Resilience 3

**C12.19 Health And Environment**

Health and Environment Change 1

Health and Environment Change 2

Health and Environment Change 3

Health and Health Care 1

Health and Health Care 2

Health and Health Care 3

Health and Health Care 4



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**C12.20 History Of Geography**

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 1

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 2

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 3

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 4

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 5

Exploring and Mapping Lands, Air and Waters. Research on the History of Geographical Explorations 6

**C12.21 Indigenous Knowledges and Peoples' Rights**

Indigenizing Development for Community Needs

Environmental Justice and Indigenous Rights 1

Environmental Justice and Indigenous Rights 2

Long-Term Engagement in Indigenous Research

**C12.22 Islands**

Island Sustainability

Island Development and Global Change

**C12.23 Karst**

Sustainable Development in Karst Environments 1

Sustainable Development in Karst Environments 2

**C12.25 Landscape Analysis and Landscape Planning**

Results and Problems of Landscapes Planning and Landscape Governance



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**C12.26 Land Use and Land Cover Change**

Problems and Consequences of Land Use/Land Cover Changes. 1 Land Use/Cover Change for Sustainable Future (Long-Term Analysis, Geospatial Data, Drivers)

Problems and Consequences of Land Use/Land Cover Changes. 2 Agriculture as Important Land Use/Cover Change Driver

Problems and Consequences of Land Use/Land Cover Changes. 3 Strategy of Land Use/Cover Change in Urban Areas

Problems and Consequences of Land Use/Land Cover Changes. 4 Cross-Sectoral (Biophysical and Socio-Economic) LUCC Drivers

Problems and Consequences of Land Use/Land Cover Changes. 5 Land Cover Changes under Specific Ecosystem Conditions And In Different Countries

Problems and Consequences of Land Use/Land Cover Changes. 6 Land Cover Changes' Impact on Carbon Stock (General Approach and Forest Regions)

**C12.28 Local And Regional Development**

Local and Regional Development in Russia 1

Local and Regional Development in Russia 2

Local and Regional Development in Russia 3

Local and Regional Development in The Rural Space 1

Local and Regional Development in The Rural Space 2

Local and Regional Development in The Urban Space 1

Local and Regional Development in The Urban Space 2

Local and Regional Development: Project and Planning 1

Local and Regional Development: Project and Planning 2

Local and Regional Development: Project and Planning 3

**C12.30 Mediterranean Basin**

Humanity and Human Activities Under Changing Climatic Conditions in the Mediterranean

**C12.30 Mediterranean Basin in Cooperation with 7Fp Marie Curie Irses Medchange 612639**

Ethnicities, Mobilities, Changing Relationships in the Mediterranean in a Global Reality 1

Ethnicities, Mobilities, Changing Relationships in the Mediterranean in a Global Reality 2

Regionalisation Concepts and Practices in 'Inner Seas' as Mobile Global Realities



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**C12.31 Modeling Geographical Systems**

Big Data Analytics and Spatial Decision Making

Modeling Fluvial and Hydrological Processes

Modeling Regional Growth and Technological Development

**C12.32 Mountain Response to Global Change**

Mountain Regions in Context of Global Change; Adaptation, New Approaches and Role of Science 1

Mountain Regions in Context of Global Change; Adaptation, New Approaches and Role of Science 2

Mountain Regions in Context of Global Change; Adaptation, New Approaches and Role of Science 3

**C12.33 Poltical Geography**

Bordering Eurasia: Politics, Power, and Political Geography 1

Bordering Eurasia: Politics, Power, and Political Geography 2

Bordering Eurasia: Politics, Power, and Political Geography 3

For Kropotkin

Russian Geopolitics and the Former Soviet Countries

Borders and Illegalities

The Critical Geopolitics of Food

Problems of Contemporary Political Geography and Geopolitics 1

Problems of Contemporary Political Geography and Geopolitics 2

Problems of Contemporary Political Geography and Geopolitics 3



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**C12.34 Population Geography**

Interactions between Human Processes, Population Changes and the Environment

Processes of Population Change and Migration 1

Processes of Population Change and Migration 2

Processes of Population Change and Migration 3

Processes of Population Change and Migration 4

Processes of Population Change and Migration 5

Processes of Population Change and Migration 6

Geographies of International Student Mobility II: the Roles of Immigration Policies, Universities, and Recruitment Agencies 1

Geographies of International Student Mobility II: the Roles of Immigration Policies, Universities, and Recruitment Agencies 2

**C12.35 Sustainability of Rural Systems**

Globalization and Rural Sustainability

**C12.38 Transport and Geography**

Geographical Impacts of Transport and Regional Development 1

Geographical Impacts of Transport and Regional Development 2

Geographical Impacts of Transport and Regional Development 3

Geographical Impacts of Transport and Regional Development 4

Geographical Impacts of Transport and Regional Development 5

Transport Development in Regions of High Latitudes or High Altitude

Russian Transport Issues: Cities, Regions, and Neighboring Countries



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**C12.39 Urban Commission: Urban Challenges in a Complex World**

Historical Cities: Activities and Management Through a Comparative Perspective East/West–North/South 1
Historical Cities: Activities and Management Through a Comparative Perspective East/West–North/South 2
Complex Urban Systems 1
Complex Urban Systems 2
Complex Urban Systems 3
Technological Innovations and Creative Activities in Cities
Contested Social Spaces 1
Contested Social Spaces 2
Contested Social Spaces 3
Contested Social Spaces 4
Creating Sustainability 1
Creating Sustainability 2
Creating Sustainability 3
Creating Sustainability 4
Creating Sustainability 5
Dilemmas of Aging Cities
Incresing Insecurity
Urban Governance 1
Urban Governance 2
Urban Governance 3
Post-Socialist Cities



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**C12.40 Water Sustainability**

Hydrological Processes and Management of Stressed Water Recourses 1

Hydrological Processes and Management of Stressed Water Resources 2

Hydrological Processes and Management of Stressed Water Recourses 3

Hydrological Processes and Management of Stressed Water Resources 4

Modeling, VGE and GIS Applications in Hydrological Research 1

Modeling, VGE and GIS Applications in Hydrological Research 2

Water Quality, Health, and Human Impacts 1

Water Quality, Health, and Human Impacts 2

**C12.41 Geomorphology and Society**

Geomorphology and Society 1

Geomorphology and Society 2

## 2. JOINT SESSIONS

**Sessions are listed following the order of commissions' number. In each case the lower commission number goes first**

**C12.01 Applied Geography**

**C12.28 Local and Regional Development**

Applied Local and Regional Development: 1 Case Studies of Sustainable Development

Applied Local and Regional Development: 2 Spatial Urban Development

**C12.06 Cold Region Environments**

**C12.18 Hazard and Risk**

Natural Hazards and Risks in Arctic and Cold Regions Environment 1

Natural Hazards and Risks in Arctic and Cold Regions Environment 2



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**C12.06 Cold Region Environments**

**C12.32 Mountain Response to Global Change**

Mountain Cryosphere in a Changing Climate: Data and Observations 1

Mountain Cryosphere in a Changing Climate: Data and Observations 2

**C12.10 Gender & Geography Commission**

**C12.33 Political Geography Commission**

Gender Activisms in Asia: Peoples, Places, and Politics

**C12.10 Gender and Geography**

**C12.34 Population Geography**

Geographies of International Student Mobility: The Roles of Gender, Class, and Ethnicity

**C12.14: Commission on Global Information Society**

**C12.15 Geography of Tourism, Leisure, and Global Change**

**C12.30: Commission on the Mediterranean Basin**

**C12.39 Urban Commission: Urban Challenges in a Complex World**

Mega Events: the Role of Spectacle in Urban Development 1

Mega Events: the Role of Spectacle in Urban Development 2

**C12.17 Global Change And Human Mobility (Globility)**

**C12.34 Population Geography**

Human Mobility and Latest Census Data: New Evidences, New Insights

**C12.20 Commission on the History of Geography**

**C12.33 Commission on Political Geography**

Rethinking What (Political) Geography Ought to Be: Theories, Histories, and Practices of Geography and Geopolitics as Instruments of Peace 1

Rethinking What (Political) Geography Ought to Be: Theories, Histories, and Practices of Geography and Geopolitics as Instruments of Peace 2



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**C12.35 Sustainability in Rural Systems**

**C12.30 Mediterranean Basin**

Strategies to Create Health, Welth, and Happiness in the Rural Areas

**C12.36 Toponymy Jointly with International Cartographic Association**

Place-Name Study and Geographical Research 1

Place-Name Study and Geographical Research 2

## 3. THEMATIC SESSIONS

**Sessions are listed by titles following the alphabetical order**

Aral Sea Syndrome – Case Studies and Consequences

Bringing Together Selenga-Baikal Research 2015

Climate Variability and Predictability 1

Climate Variability and Predictability 2

Coastal Erosion and Dynamical Processes in the Nearshore Zone

Cultural Regionalism and Regional Identity

Evolution of Earth Cryosphere In Changing Climatic Conditions and under a Human-Induced Disturbances

Free Economic Zone Phenomenon: Theoretical Analysis and Case Studies

Geography Methods for Preservation of Heritage

Landscapes of Energy

Lakes in a Changing World

Land Use and Nature Conservation in Riparian Areas – The Interrelation between Efficient Ecosystem Functions and Beneficial Ecosystem Services on Floodplains

Mathematical Morphology of Landscape and Landscape Metrics

Pan-Eurasian Experiment (Peex) – a Research Initiative Meeting "The Grand Challenges of the Changing Environment of the Northern Pan-Eurasian Arctic-Boreal Areas"

Russia and Canada in the Northern Dimension: Economic Development of Northern Regions



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Russia and Canada in The Northern Dimension: Indigenous People

Sediment Redistribution and Exogenic Processes Dynamics in Small River Basins

Urban Climate and Urban Planning

Urban Geography of Arts: the Co-Production of Arts and Cities

Urban Governance and Inclusive Cities in India

Urban-Rural Transformation in the Euro-Asian Continent

Water Resources Change in Eurasia in XXI Century

## 4. SPECIAL SESSIONS

**Sessions are listed by titles following the alphabetical order**

Canada/Quebec: 100 Mirrors

Geoheritages, a Recorder of the Global Change along the Silk Road for Future Sustainable Development

Natural Resource Management in Drylands: Problems of Climate Change Adaptation and Achieving Land Degradation Neutrality 1
Natural Resource Management in Drylands: Problems of Climate Change Adaptation and Achieving Land Degradation Neutrality 2

## 5. LECTURES OF INVITED SPEAKERS

**PLENARY LECTURES**

**THEMATIC LECTURES**



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# COMMISSION AND TASK FORCE SESSIONS


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# C12.03 Biogeography and Biodiversity

## Response of Mountain Ecosystems to Climate Change

**Chairperson(s):** *Udo SCHICKHOFF, Suraj MAL*

- Projected Climate Change Impact on Bioclimatic Zones, Terrestrial Ecosystems and Biodiversity in the Asian Highlands

  *Robert ZOMER, Jianchu XU, Mingcheng WANG (China (Beijing))*

- Estimating recent glacier changes in Nanda Devi region, Central Himalaya, India, using Remote Sensing data

  *Suraj MAL, RB SINGH (India); Udo SCHICKHOFF (Germany)*

- Ecosystem change of the Mongol Altai mountain range

  *Tsedevdorj SER-OD, Ayurzana CHANTUU, Bat-Erdene TSEDEV, Amgalan AVKHINSUKH, Enkhjargal PUREVSUREN, Getsel Uranchimeg (Mongolia)*

- Dynamics of mountain landscapes of the Northern Caucasus as response to current climatic changes

  *Marina PETRUSHINA, Elena SUSLOVA (Russian Federation)*

## Biogeography and Conservation of Biodiversity 1

**Chairperson(s):** *Udo SCHICKHOFF, R.B. SINGH*

- Actual biogeography of Russia: key changes, status and trends of biodiversity

  *Arkadiy TISHKOV (Russian Federation)*

- Vegetation change after 30 years and damage by deer grazing in alpine meadow of the Southern Japan Alps

  *Kazuharu MIZUNO (Japan)*

- Invasive terrestrial plant species in romanian protected areas. Key environmental features and spreading pathways

  *Monica DUMITRASCU, Ines GRIGORESCU, Gheorghe KUCSICSA, Mihai DOROFTEI (Romania)*

- Spatio-Temporal and Comparative Analysis of Tiger Landscape Complex in India, (2006 – 2014)

  *Bhanwar Vishvendra Raj SINGH, Anjan SEN (India)*

- The Ecological Potential of Baikalian Siberia's Geosystems

  *Igor N. VLADIMIROV (Russian Federation)*



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**Biogeography and Conservation of Biodiversity 2**

**Chairperson(s):** *Udo SCHICKHOFF, R.B. SINGH*

- Conservation of the old-agrarian landscapes for the high biodiversity sustention

  *Elena BELONOVSKAYA (Russian Federation), Alexander KRENKE (Russian Federation), Arkadiy TISHKOV (Russian Federation), N.G. TSAREVSKAYA (Russian Federation), J.M. MATUSZKIEWICZ, A. KOWALSKA*

- Landscape and Floristic Diversity of Heterogeneous Catchments of Steppe and Forest-Steppe Zones (Altai Krai, Russia)

  *Dmitry ZOLOTOV, Dmitry CHERNYKH (Russian Federation)*

- Distribution of allergenic plants in Russia

  *Tatiana DIKAREVA, Vadim RUMIANTSEV (Russian Federation)*

- Mapping of Sacred Groves from Konkan Region of Maharashtra State, India : The Repositories of Bioresources, Culture and Religion

  *Chandrakant SALUNKHE, S. RASKAR (India)*

**Biogeography and Conservation of Biodiversity 3**

**Chairperson(s):** *Udo SCHICKHOFF, R.B. SINGH*

- Conservation Biogeography in the Moscow University: Analyses of Biodiversity Distribution and Selecting Priority Areas for Protection in Palearctic

  *Tatiana DIKAREVA, Elena KOROLEVA, Vladimir NERONOV, Alexey ROMANOV, Elena SUSLOVA, Marina VOLCHENKOVA, Evgeniya MELIKHOVA (Russian Federation)*

- Researching geography of the Northern Eurasia biotic diversity by using criteria of species activity and abundance

  *Ludmila EMELYANOVA, N. LEONOVA, K.GONGALSKY , L. LEVIK , A. REPINA , M. DYCHKIN, E. VACHSH-CHENKOVA , D. KUZNETZOVA , P. KUZNECHENKO (Russian Federation)*

- Spectral properties of subarctic plants

  *Mikhail ZIMIN, Elena GOLUBEVA, W. REES, Olga TUTUBALINA (Russian Federation)*

- The conservation of landscape and biological diversity of steppe ecosystems within the Orenburg-West Kazakhstan transboundary region

  *Dmitriy GRUDININ, Sergey LEVYKIN, Valentina CHIBILYOVA, I. YAKOVLEV (Russian Federation)*



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**Biogeography and Conservation of Biodiversity 4**

**Chairperson(s):** *Udo SCHICKHOFF, Kazuharu MIZUNO*

- Spatial restructuring of biodiversity in long time ago assimilated regions of European Russia under the impact of the "fast" socio-economic changes of the last decades

  *Petr GLAZOV, A. TISHKOV, G. TERTITSKI, A. MEDVEDEV, M. GUNKO, N. TSAREVSKAYA, E. BELONOVSKAYA (Russian Federation)*

- Deforestation and its Impact on Environment in Umtrew River Basin, North East India

  *Dhanjit DEKA, Pradip SHARMA (India)*

- Changes in Livelihood of a Shifted Forest Village: A case study on Satargaon of Rani-Garbhanga RF, Assam, India

  *Pradip SHARMA, Mahfuza RAHMAN, Koichi KIMOTO (India)*

- Re-Inventing A Traditional Green Product In The Contemporary Globalized World - Social Marketing Of Traditional Perfume 'Attar'

  *Soma SENGUPTA, Anjan SEN (India)*

- Potential of Mountains Areas for Biodiversity Conservation in Swaziland

  *Ndumiso Cyprian MAGAGULA, Sizwe MALINDZISA, Maria C. PIRES, Dlamini PHILILE B., Sibusiso A. MALAZA (Swaziland)*

**Biogeography and Conservation of Biodiversity 5**

**Chairperson(s):** *Udo SCHICKHOFF, Kazuharu MIZUNO*

- Biomes of Russia: the experience of review bioecological mapping

  *Tatyana KOTOVA, G.N. OGUREEVA, M.V. BOCHARNIKOV, I. M. MIKLYAEVA, S. V. DUDOV (Russian Federation)*

- Modern trends of vertebrate fauna changes in the zonal ecotone of the southern taiga and mixed coniferous-broad-leave forests at the Valdai Hills

  *Olga LEONTYEVA, D.M.GLAZOV, P.M. GLAZOV, L.A. KHLYAP, A.A. MEDVEDEV, V.I. NIKOLAEVA, A. A.TISHKOV (Russian Federation)*

- Entomogeography: Past, Present, Future

  *Mikhail SERGEEV (Russian Federation)*



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- Development of representative network of Marine Protected Areas in the Russian Arctic

  *Boris SOLOVYEV, I. ONUFRENYA, D. GLAZOV, A. SAVELIEV, V. SPIRIDONOV, D. DOBRYNIN, A. PANTYULIN, E. CHUPRINA, N. PLATONOV (Russian Federation)*

- Climate Change Impacts On Ecosystem And Biodiversity In Nigeria

  *Haruna Kuje AYUBA (Nigeria)*

**POSTER EXHIBITION**

- Influence of lighting conditions on spectral and morphometric characteristics of Hordeum Vulgare

  *Elena GOLUBEVA, Mikhail ZIMIN, Olga TUTUBALINA, I. SADOVAYA (Russian Federation)*

- Changes of Wildlife Biodiversity in the European Russia (the End of the XVIII Century – XXI Century)

  *Vadim RUMIANTSEV, Alexey GOLUBINSKY, Mikhail SOLDATOV, Dmitry KHITROV, Anton ARUTIUNOV (Russian Federation)*

- A Research on the Features of Plant Diversity at Ebinur Lakeside Wetlands

  *Yanhong LI, Wang PANPAN,Yuan JIE, Jin LI (China (Beijing))*

- Series of soil properties maps in the Ecological Atlas of Russia

  *Maria GERASIMOVA, Maria BOGDANOVA, Tatiana KOTOVA (Russian Federation)*

- Influence of Sea of Japan upon the Structure of Oak Forests in the Coastal Zone of the Eastern Sikhote Alin Mountains

  *Valentina MAKSIMOVA, Elena GOLUBEVA (Russian Federation)*

- Identification of vegetation types and ecosystems associated with atlantic forest in the Ilha Grande, Rio de Janeirostate, Brazil

  *Yame Medina RAMOS, Heloisa Helena Gomes COE, André Luiz Carvalho da Silva, Emily GOMES, Leandro de Oliveira Furtado de Sousa (Brazil)*

- Invasive Species and Fire: A Double Blow to Biodiversity Conservation in Southern Africa

  *Sibusiso MALAZA, Candice GREENLAND, Siphumelele NKOMO, Philile DLAMINI, Fadzai PWITI (Swaziland)*

- Variability of phytoplankton community of north-eastern Black sea caused by natural and anthropogenic factors

  *Antonina POLYAKOVA (Russian Federation)*



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**Projected Climate Change Impact on Bioclimatic Zones, Terrestrial Ecosystems and Biodiversity in the Asian Highlands**

*Robert ZOMER, Jianchu XU, Mingcheng WANG (China (Beijing))*

Climate change is projected to have major impacts on terrestrial ecosystems, particularly in the fragile highland and mountainous regions of Asia. Many of these impacts are already evident across the Himalaya, Hindu Kush, and Tien Shan, mountains, as well as the high elevation Tibetan Plateau. This mountainous regions are rich in biodiversity and contains a diverse array of biomes, ecoregions and and many "Global Biodiversity Hotspots", as well as much endangered flora and fauna. The spatial displacement of bioclimatic strata by the year 2050 has been used as a indicative measure of likely biological perturbation and impact on terrestrial ecosystems and ecosystem services, including biodiversity. A statistically-based bioclimatic stratification and regional geospatial analysis, based upon a framework developed using the Global Environmental Stratification (GEnS) which was produced as part of the Global Earth Observation – Biodiversity Observation Network (GEO-BoN) to facilitate comparative research, was applied across the Asian highlands region to assess project future impacts of climate change on terrestrial ecosystems, including biodiversity and agricultural production. The resulting bioclimatic stratification is based up a multi-model ensemble (n=19) of the most recent future climate projections provided by the Coupled Intercomparison Modeling Project – Phase 5 (CIMP-5) for the year 2050, across the range of IPCC AR-5 resource concentration pathways (RCPs). Spatial shifting of bioclimatic strata, particularly upward shifts with mountainous regions, are anticipated to have major impacts on terrestrial ecosystems, biodiversity, agricultural and pastoral production systems, and conservation efforts across all bioclimatic zones, and thoroughout the region. Results have been used to evaluate effectiveness of protected areas and as input for design of conservation corridors and landscape connectivity.



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**Estimating recent glacier changes in Nanda Devi region, Central Himalaya, India, using Remote Sensing data**

*Suraj MAL, RB SINGH (India); Udo SCHICKHOFF(Germany)*

The state of changing glacier is considered as an important indicator of climate change. Climatic warming and cooling are quickly reflected in shrinkage and expansion of glaciers. They are important source of water supply particularly in summers in northern Indian plains, thus have significant influence on eco-system services, agriculture and socio-economic conditions. Therefore, the present study assesses recent changes (2001-2013) of glaciers in Nanda Devi region using remote sensing data. A total of 30 glaciers were mapped on Landsat ETM+ (2001) and OLI (2013) and compared to estimate the changes in snout positions. The study reveals that there are significant variations in glacier retreat. The retreat rate varies between 5.6 m per year (Lawan glacier) to about 35.6 m per year (Pacchu glacier). Of the total 30 glaciers, 6 retreated with less than 10 m per year, 16 between 10-20 m per year and 5 between 20-30 m per year and 3 more than 30 m per year. An attempt has also been made to assess underlying driving forces of varying retreat rate of glaciers. The elevation of snout, area and length of glaciers were found to have significant implications on retreat rate. These factors together explained about 20 per cent of all forces responsible for the varying rate. There are however some other important factors e.g. accumulation area ratio, slope angles of accumulation and ablation, amount of rainfall and snowfall and temperature conditions and debris cover that have significant bearings on glacier retreat.



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**Ecosystem change of the Mongol Altai mountain range**

*Tsedevdorj SER-OD, Ayurzana CHANTUU, Bat-Erdene TSEDEV, Amgalan AVKHINSUKH, Enkhjargal PUREV-SUREN, Getsel Uranchimeg (Mongolia)*

Due to the global warming, glaciers, decreasing water resources, and soil degredation and vegetation cover are seen clearly in the Altai Mountain Range which is located in the border between Russia and Mongolia. This Mountain Range included in Altai-Soyon mountain realm which one of 200 Eco-regions in the World. Altai mountain range covers 600,000 sq.km area stretching across between the Russia, Mongolia, Kazahstan and China. In the paper, it was shown the result of joint research of the Geography department of Mongolian National University of Education, the Saint Petersburg University, Khovd University and Geo-ecological Institute of Mongolia. Also it will be presented impacts of climate and ecosystems changes to compare with the previous results of 1970-2007 and melting intensity of Tavan Bogd Mountain's glaciers using satellite image as well as environmental issues of Khovd river basin Khovd river is one of the biggest rivers in this region. Also, study covers of influencing factors to the landscapes, such as mountain tundra, alpine meadow, alpine steppe, dry steppe, semi dessert and dessert in the mountains etc. The research result will be used to carry and organize activities, which are protected the ecosystems, such as water cycle, permafrost, soil degradation and to provide favorable environment to live animals and plants.



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## Dynamics of mountain landscapes of the Northern Caucasus as response to current climatic changes

*Marina PETRUSHINA, Elena SUSLOVA (Russian Federation)*

Dynamics of mountain landscapes of the Northern Caucasus have been analyzed on the basis of long-term field landscape studies, interpretation of remote sensing data and phytoindication. The region is characterized by dynamic, contrast and metachronic landscape structure, resulting from active natural processes, including snow avalanches and debris flows, aggravated by human activities. Several periods with different landscape changes reflecting climatic fluctuations since the middle of the 20-th century with particular attention to the Teberda valley and the Elbrus region were revealed. The trend of landscape aridization was exacerbated in the 40-ies and from the end of the 70-ies to the middle of 80-ies of the XX century and was relaxed by increasing humidity in the following period. The last decades are notable for increase of temperature contrasts and precipitation, mainly in spring that cause activity of snow avalanches including large and disastrous ones and as a result changes in structure and functioning of landscapes. Snow avalanches initiated some debris flows in the places where they were not observed for the past 40-50 years if ever and complicated landscape structure in the zones of their common release. The reduction of forests, the increase of shrubs, the appearance of new erosion forms, debris flow fans and avalanche deposits, are some results of nature processer's activity. The areas affected by debris flows and avalanches are characterized by different stages of vegetation and soil succession changing in the periods of climatic fluctuations. The degradation of glacio-nival landscapes and landscape changes in the periglacial zone with expansion of meadow and forest ecosystems have been also revealed due to the some increase of summer temperature. The unique "onglacial" ecosystems form on the surface of some glaciers nowadays.



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**Actual biogeography of Russia: key changes, status and trends of biodiversity**

*Arkadiy TISHKOV (Russian Federation)*

Actual biogeography of Russia: key changes, status and trends of biodiversity. According to 5th National report on biodiversity (Tishkov, 2014), the territory of the Russia contains about 12 500 species of vascular plants and 1513 - of vertebrates (320 - mammals, 732 - birds, 80 - reptiles, 29 - amphibians, 343 - freshwater fish). In 2014 threatened species include 0.1% - invertebrates, 5% - plants, 7% - fish, 17% - birds, 20% - mammals, 28% - reptiles, 30% - amphibians. Certain positive achievements were made in stabilisation and increase in population of rare species (f. ex. Amur tigers, Far-Eastern leopard, European bison). According to the state monitoring data, the condition of game species is generally stable, for some species positive dynamics is observed. The following negative trends in state of terrestrial landscape diversity: increased fragmentation of tundra, taiga and stepped; transformation of traditional agricultural landscape; continuous 'islanding' and size minimization of remained steppe due to returned high ploughing pressure and grass fires; change of the structure of traditional agricultural landscapes of the Caucasus. The following direct and indirect threats to biodiversity were specified and placed: destruction of animal and plant habitats, chemical pollution, fragmentation of landscapes, low feeding quality of habitats for migrating animals, threat of native biodiversity transformation due to alien species invasions. After Udo Schickhoff, a.o. (2014) note that biogeography as a science with a synthetic character and variety of interdisciplinary approaches indicatively confirm the beginning of a new epoch of development of nature and irreversibility of its changes. For Russia identified significant changes in diversity and distribution of many species of animals and plants and their habitats. In the end, over the last Millennium in the Northern Eurasia formed new boundaries of the distribution of species and biomes, changed faunistic complexes, expanded range of invasive species. The reasons for the new biogeographical phenomena in the synergy of human activity and strong and rapid changes in global climate (Tishkov, 2012, 2014).



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**Vegetation change after 30 years and damage by deer grazing in alpine meadow of the Southern Japan Alps**

*Kazuharu MIZUNO (Japan)*

I researched the vegetation of alpine meadow in the Southern Japan Alps during 1981-82 and again in 2011-12, examining the changes 30 years apart. The alpine meadow of "Sanpuku Toge" (2620m in altitude) below the forest line was dominated by Trollius japonicus and Ranunculus acris var. nipponicus in 1981-82, and protected from damage by grazing deer through the use of a fence, while the area beyond was occupied byVeratrum album ssp. oxysepalum var. alpestre in 2011-12. The alpine meadow of "Hijiridaira" (2370m in altitude) below the forest line was dominated by Hemerocallis dumortieri var. esculenta in 1981-82, likewise protected from grazing deer through the use of a fence and the area beyond occupied byVeratrum album ssp. oxysepalum var. alpestre in 2011-12. Although the alpine meadow of "Kitaarakawadake-yoko" (2650m in altitude) below the forest line was dominated by Trollius japonicus and Ranunculus acris var. nipponicus in 1981-82, by 2011-12 it was occupied by Ligularia dentata. Most alpine meadows below the forest line have recently been damaged by deer grazing because the number of deer has increased as a result of global warming. The alpine meadow (2900m in altitude) in the nivation hollow of the summit of Mt. Higiri was occupied by Phyllodoce aleutica and Geum pentapetalum in 1981-82. It was occupied by those same species in 2011-12, but Empetrum nigrum var. japonicum and Loiseleuria procumbens also dominated. Although this alpine meadow above forest line was not damaged by grazing deer, it may have been affected by global warming because Empetrum nigrum var. japonicum and Loiseleuria procumbens have increased as evidence in experiments in global warming using open-top chambers of acrylic plate, a program that has continued in the Central Japan Alps since 1995.



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**Invasive terrestrial plant species in romanian protected areas. Key environmental features and spreading pathways**

*Monica DUMITRASCU, Ines GRIGORESCU, Gheorghe KUCSICSA, Mihai DOROFTEI (Romania)*

Biological invasions rank among the most critical ecological threats both to natural habitats and biodiversity due to their high adaptive capacity to wide ecological conditions and multiplication potential. The current paper is seeking to provide a geographical insight on the relationship between invasive terrestrial plant species (ITPS) and the main environmental driving forces responsible for their introduction and spread in the Romanian protected areas: natural (e.g. relief, lithology, soil, hydrology) and human-induced (e.g. agriculture, grazing, deforestation, mining) on selected case-studies for each biogeographical region in Romania: Maramureş Mountains Natural Park (Alpine region), Mureş Floodplain Natural Park (Pannonic region), Comana Natural Park (Continetal region), Măcin Mountains National Park (Steppic region) and Danube Delta Biosphere Reserve (Pontic region). Thus, a complex assessment of the relationship between the most relevant ITPS (e.g. Amorpha fruticosa, Ailanthus altissima, Impatiens glandulifera, Fallopia japonica) and their foremost driving factors was carried out, based on the GIS geoprocessing of relevant cartographical materials (e.g. geology, hydrogeology, soil, vegetation) and statistical data, as well as field surveys using GPS measurements. Moreover, some biological indicators (abundance, frequency and ecological significance) in relation to the environmental features were computed. The outcomes will greatly contribute to the development of an ITPS potential distribution model able to predict species spreading pathways and recurrence capacity. The current research was carried out in the framework of the EU FP7 – Building Capacity for Black Sea Catchment Observation and Assessment System supporting Sustainable Development (EnviroGRIDS).



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**Spatio-Temporal and Comparative Analysis of Tiger Landscape Complex in India, (2006 – 2014)**

*Bhanwar Vishvendra Raj SINGH, Anjan SEN (India)*

Our future and development process depends on carrying capacity of our environment but now we are crossing to threshold limit of our environment. Meanwhile presence of each and every component of flora-fauna is very essential for man-environment relationship; in the terms of environment Tiger is also part of them. The tiger is the top consumer of a terrestrial ecosystem and also known for umbrella specie. Its conservation automatically ensures the conversation of a large number of flora and fauna and entire ecosystem. Therefore the present research focuses on six tiger landscape complexes in India. Every tiger habitat has a different feature and different characteristics of production system. This paper shows the current situation of Tiger population from 2006 to 2014. The study analyses the last four year (2011, 2012, 2013 and 2014) tiger mortality rate due various causes. The study is based on both qualitative and quantitative methods. The research is presented through Arc-GIS and Erdas Software's and also some statistical tools are used for data analysis. All the landscapes have drastically changed due to anthropogenic activities and natural events. The study found that the population of Tigers and tiger hotspots is changing in all landscapes. There are lot of factors for these changes, and results show healthy progress of tiger conservation and also tiger habitat. Better Tiger conservation can lead to sustainable development through management of ecosystem services. If these trends continue, the wild tiger may evolve from being an endangered species.



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## The Ecological Potential of Baikalian Siberia's Geosystems

*Igor N. VLADIMIROV (Russian Federation)*

There are several definitions of the ecological potential, but they are all limited largely to interpreting it as the set of natural conditions necessary for the life and reproduction of organisms inhabiting a given territory. Assessments of the ecological potential of geosystems provide a general idea regarding the existence conditions of people living therein and create the natural-science framework for a reasonable regional ecological policy, and improvements in the population distribution system and the social sphere, rational organization of labor and recreation, and in human health protection. Investigations into the ecological potential, and the factors and conditions influencing its formation used: - Digital Elevation Model (DEM) as developed on the basis of data from the Shuttle Radar Topography Mission (SRTM); - WorldClim set of global climate layers (climate grids); - data on Net Primary biological Production (NPP), the result from processing MODIS Terra/Aqua remote sensing data; - Normalized Difference Vegetation Index; - Enhanced vegetation index. All data obtained in the form of regular grids (morphometric and climatic indices, NDVI and EVI values, and NPP) have been converted to a vector form and represent a set of regularly distributed points. The GRID model of Baikalian Siberia contains 672 048 points. Exhaustive coverage of all possible natural ecological factors determining the ecological potential of geosystems is impracticable. It is necessary to discriminate between the main, governing factors and secondary factors, i.e. to take into account their contribution (weight) to the value of the potential. In calculating the ecological potential, to determine weight coefficients used the method of analysis of hierarchies, a powerful mathematical tool for a systematic approach in solving complex decision-making problems.



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**Conservation of the old-agrarian landscapes for the high biodiversity sustention**

*Elena BELONOVSKAYA (Russian Federation), Alexander KRENKE (Russian Federation), Arkadiy TISHKOV (Russian Federation), N.G. TSAREVSKAYA (Russian Federation), J.M. MATUSZKIEWICZ, A. KOWALSKA*

On the example of the National park "Valdaisky" (Novgorodskaya oblast, Russia) biota's evolution history the importance of the old man-made forest-field-meadow landscape for the high biodiversity level sustention was showed. According to the sporo-pollen analysis' data and archaeological records the agrarian landscape's formation in the region included several stages. At the first one the settlements were distributed mainly along river-sides and lake shores. In the second stage ("the Middle-age climatic optimum", beginning of the II millennium AD) the forestless areas were broaden and soil reclamation was in process. The remote sensing data (Landsat 5) reveals that the actual vegetation mosaic inherits the old agrarian fragmentation of the VIII-XIV centuries, when it was the result of slash and burnt farming with the spatial elements of 2 ha. The high biodiversity was composed of various natural and anthropogenic ecosystems: decidious, coniferous and mixed forests', raised bogs', man-made meadows' and arable lands' elements. The original forest fauna is consisted also with the species of forestless areas (30%) and invasive species (8%). During the last 25 years the former arable lands were overgrown with secondary forests: birch (36,7%), alder (15,7%) and pine (17,3%). This process is accompanied by significant changes in biota and reduction of recreational qualities of the National park. Biota transformation processes' similarity of the end-moraine relief regions in Poland, Lithuania, Latvia, Belorussia, Russia (Pskovskaya and Novgorodskaya oblast) are observed. For the sustention of the high level of the biodiversity and its ecosystem's services of the old-agrarian regions the traditional farming is used to be renewed.



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**Landscape and Floristic Diversity of Heterogeneous Catchments of Steppe and Forest-Steppe Zones (Altai Krai, Russia)**

*Dmitry ZOLOTOV, Dmitry CHERNYKH (Russian Federation)*

The comprehensive studies (since 1995) carried out on the Ob Plateau (the South of Western Siberia) in contemporary zonal and morpholithologic non-uniform catchments, formed in the ancient flow gully, allowed a number of interesting conclusions on the interrelation of landscape and floristic diversity. 1) Elementary floristic and landscape regions (microregion) correspond to each other in space, and their boundaries can be unified, since the differentiation is determined by the same combinations of interrelated environmental factors. 2) Landscape and floristic diversity are interrelated nonlinearly and ambiguously. Their relation may differ at different hierarchical levels, i.e. the greater landscape diversity can show as the larger as the smaller floristic diversity. Only at the elementary topological level (facies – phytocenosis) a linear relationship can be found: the more contrast the facies, the larger the number of their types, the richer the partial flora for each facies type, the higher is the taxonomic and typological diversity of integrated partial floras. 3) The specific landscape units are of different importance for floristic spatial differentiation. Some geosystems have indicative value for a particular state or process and contain differential or indicator plant species, other geosystems are indifferent and do not contain any. 4) Landscape and floristic microregions represent natural operating territorial cells for the assessment and regulation of the environmental impact, the organization of nature protection and management, and landscape planning. The work is supported by the Russian Foundation for Basic Research [grant number 15-05-01760-a].



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**Distribution of allergenic plants in Russia**

*Tatiana DIKAREVA, Vadim RUMIANTSEV (Russian Federation)*

Distribution of allergenic plants in Russia Tatiana V. Dikareva, Vadim U. Rumiantsev Dept. of Biogeography, Faculty of Geography, Lomonosov Moscow State University, Moscow, Russia By the end of the XX-th century allergy became one of the most widespread diseases in industrial countries. One of the causes of allergy is the plant pollen. Plant pollen allergy - pollinosis – is the disease of each fourth inhabitant of our planet. We analyzed for the first time the geographical distribution of the main allergenic plants in Russia. For analysis we selected 119 plants – the most widespread or producing the largest amount of pollen – i.e. the most dangerous for allergy sufferers during flowering. The selected species were divided into two groups: spring-flowering and summer-flowering. All material was organized as database and attached to the map in GIS Mapinfo. For each region of Russian federation two indices were calculated: the total number of allergenic plants in the region and "allergenic index". The series of maps were designed: the number of spring-flowering species, the number of summer-flowering species, summarized number of species flowering during the whole year, the total allergenic danger during spring and summer seasons respectively, and the summarized allergenic danger during the whole year. Judging by number of allergenic species and by "allergenic index" the most dangerous regions appeared to be Ryazan and Voronesch regions while the less dangerous – Chukotka and Magadan regions. Thus the analysis revealed the principal laws of allergenic plants distribution in Russia. The maps may serve as reference source for allergologists and allergy sufferers.



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**Mapping of Sacred Groves from Konkan Region of Maharashtra State, India : The Repositories of Bioresources, Culture and Religion**

*Chandrakant SALUNKHE, S. RASKAR (India)*

Sacred groves in India were protected since ages by local peoples and tribal communities as a tradition of nature worship dedicated to deities or ancestral spirits. Theses groves are perennial sources of freshwater and act as sanctuaries of natural resources like indigenous medicinal plants, wild vegetables, fruits and fodder plants. About 13,720 sacred groves have been reported from India. Out of 2837 sacred groves documented for Maharashtra state, Ratnagiri and Sindhudurg districts, falls within the Konkan region has about 2332 sacred groves occupying an area of 3098.55 ha. To highlight the geographical, historical, social and environmental significance mapping of about 819 sacred groves from this region have been completed with the help of GPS. The information about deities, festivals, rituals, ethnobotany and detailed floristic diversity inventory has been documented. These sacred grove forests with massive population of centuries old trees act as a major sink of CO2 and have the great potential to face and reduce the adverse effects of global warming and climate change. Rapid urbanization in the recent past has transformed and weakened both cultural integrity and cause serious impacts on the status of sacred groves ecology. Sanskritization, changes in social belief, urbanization, erosion of cultural practices, unsustainable development projects like dams, mining and road construction are the major reasons responsible for deterioration of these cultural and natural heritage. The present work of mapping and documentation of natural resources from sacred groves will greatly help in proposing management plans to conserve these gardens of gods for sustainable future.



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**Conservation Biogeography in the Moscow University: Analyses of Biodiversity Distribution and Selecting Priority Areas for Protection in Palearctic**

*Tatiana DIKAREVA, Elena KOROLEVA, Vladimir NERONOV, Alexey ROMANOV, Elena SUSLOVA, Marina VOLCHENKOVA, Evgeniya MELIKHOVA (Russian Federation)*

Conservation Biogeography in Moscow State University originates from Russian biogeography school which was founded by its leader Prof. Anatoly G. Voronov. In his earlier studies he used an example of Palearctic biota study as a model of geographical approach to the wildlife conservation (Voronov, Kucheruk, 1976). In the context of this school development and global biodiversity research at the turn of the XX-XXI centuries we carried out relevant investigations on theory and practice of the protected areas network creation. The studies of the biogeography department on the identification of priority regions for biodiversity conservation are underway on continental, national, regional and local levels (Koroleva, Neronov, 2007; Romanov, 2013 et al). The populations of protected species of plants and animals are considered as elementary units of biological diversity. The case studies from Asian Subarctic mountains, Central Kazakhstan, Mongolia, Ciscaucasia, Volga, Moscow and Baltic regions as well as for local urban territories are demonstrated. Biogeography analyses of biodiversity distribution results and monitoring of endangered species are discussed and effective strategies of wildlife conservation in different regions are proposed. Several case studies highlight usage of integral approaches, databases, biogeographical maps and models as well as remote sensing materials for analyses of biological and geographical information in common about Palearctic biota. Conservation Biogeography in the Moscow University is developing at the interdisciplinary platform of geographers, biologists, ecologists, and landscape designers collaboration.



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## Researching geography of the Northern Eurasia biotic diversity by using criteria of species activity and abundance

*Ludmila EMELYANOVA, N. LEONOVA, K.GONGALSKY , L. LEVIK , A. REPINA , M. DYCHKIN, E. VACHSHCHENKOVA , D. KUZNETZOVA , P. KUZNECHENKO (Russian Federation)*

Increasing tendency to discover the global level objective laws is determining in biodiversity concept development at current. Existing schemes of natural, geobotanic, floristic, faunistic and zoogeography division for the Northern Eurasia (by Gorodkov, 1935; Shtegman, 1938; Sochava, 1956; Alexandrova,1977; Jurtzev, 1996,2001) are differ to some extent and this fact stipulates a complex biotic analyzing at the base of species ranges' structure. Synthesis of local surveys data gives the important results in this direction. By now a great volume of local data has been accumulated including data on plant' species activity and abundance accounting for some well-known land animal' species. Such surveys have been begun for some groups of invertebrates as their state of knowledge had reached a cartographical maturity (oribatid mites, millipedes, earthworms, woodlice). Geographical interpretation of local data allows detecting types of spatial organization for species ranges, environmental factors of species population distribution and biotic cover as a whole. The theoretical concepts for coenotic range, range optimum, geographical and genetic elements of flora and fauna have an important role for development of this study as well as cartographical method and GIS-technology in areology. It is supposed to assess the plant species activity by their abundance and constancy within different classification units and by their belonging to certain diagnostic species group. Quantitative records of some animals are implemented by standard methods within the whole range territory. Our researches include the ranges' classification according to the northern boundary position and mapping range structure for typical species of boreal biota.



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## Spectral properties of subarctic plants

*Mikhail ZIMIN, Elena GOLUBEVA, W. REES, Olga TUTUBALINA (Russian Federation)*

Current research is based on the materials of field and laboratory studies of subarctic plants dominating treeline ecotone ecosystems, which have been conducted since 2011 on the territory of the central part of the Kola Peninsula, Russia, using ASD FieldSpec3 Hi-Res hyperspectroradiometer and Skye Instruments SpectroSense2 + spectroradiometer. The main hypothesis of the study is that spectral signatures of plants and vegetation in general, as an indicator of the ecological state of ecosystems, qualitatively and quantitatively reflect the nature and extent of anthropogenic impact, moisture content, phenology, growth conditions, lighting and other factors. Our objects are tundra and northern taiga plants and ecosystems in both natural and technogenically disturbed environments. During the study period, we have developed standardized methods of collection and processing of spectrometric measurements aimed at creating library of spectral signatures to support satellite image interpretation. We have measured around 1500 samples in total. Research results demonstrate the ability of green vegetation to selectively reflect solar radiation, depending on the species composition and state: - on the basis of spectral signatures we can distinguish different types of species of trees, shrubs, mosses, lichens and grasses; - impact of species characteristics and habitat conditions is clearly reflected in the spectral signatures of different types of arctic plants; - measurements of the spectral signatures of birch leaves clearly indicate chlorosis and necrosis, even when a small part of the leaf is affected. This study is supported by RFBR, grant 13-05-12061 офи-м and by the Spectral Library of Arctic Plants (SLAP) project of the INTERACT program.



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**The conservation of landscape and biological diversity of steppe ecosystems within the Orenburg-West Kazakhstan transboundary region**

*Dmitriy GRUDININ, Sergey LEVYKIN, Valentina CHIBILYOVA, I. YAKOVLEV (Russian Federation)*

A range of agreements was signed between the Russian Federation and Kazakhstan by XXI century. They provide intergovernmental and inter – regional collaboration, including on the field of nature conservation actions. We considered issues about zonal steppe landscapes within the transboundary territories in Orenburgskaya oblast RF and Kazakhstan: West Kazakhstan, Aktyubinskaya and Kustonayskaya oblasts; we separated out plots, which were perspective for development of transboundary steppe RNT (Reserve Nature Territories). The region covers landscapes of all subzones in the steppe zone. The high anthropogenic load in the past led to almost total disappearance of plane steppes on the loamy soil, degradation of soil and steppe biota. At the same time, steppe ecosystem, on the whole, and plane steppes, in particular, is offered unrepresentatively in a RNT network of Russia. Protected regime, applied to incomplete components of steppe ecosystems, which deprived of megafauna, is not effective. In the frame of the indicated factors, restoration of secondary steppes on the plots of an unclaimed land fund of the transboundary territory and frontier position of the existing steppe RNT make the region to be perspective for development of a transboundary RNT network. During 2009-2014 authors carried out land use monitoring within the transboundary territory, separated out plots of secondary steppes restoration and worked out measures for effective conservation of landscape and biological diversity in steppes.



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## Spatial restructuring of biodiversity in long time ago assimilated regions of European Russia under the impact of the "fast" socio-economic changes of the last decades

*Petr GLAZOV, A. TISHKOV, G. TERTITSKI, A. MEDVEDEV, M. GUNKO, N. TSAREVSKAYA, E. BELONOVSKAYA (Russian Federation)*

"Fast" climate changes along with economic transformations affect the biodiversity, distribution and abundance of many vertebrates' groups through the transformation of land use. In the period of 1990-2015 in Russia the socio-economic factors had different impact on animal habitats, their prey, migration routes, nesting and wintering. Degradation of agricultural lands in the European part of Russia have occurred over the past 100 years, but most rapidly these processes have gone after the collapse of the USSR. There are processes of agricultural land abandonment on the periphery, but also active land use around central parts of the regions. This changes the landscape mosaic, the ratio of forest and arable lands, which leads to a change in biodiversity – in quantity and quality. In the forest regions of European Russia the significant depopulation of rural areas and declining in living standards led to a "compressed" agricultural activity. Abandonment of agricultural land has positive (reforestation, reduction of anthropogenic impact on fauna) and negative (reduction of agricultural lands - meadows and croplands that are important for local and migratory fauna as forage lands) consequences for vertebrate fauna. The percentage of forested areas in the Upper Volga in the past 20 years has increased overall by 8%, and the area of arable land decreased by 1.5-2.5 times. This situation caused the rise of a number of forest mammals, but has a negative impact on the composition of the field's mammals and migratory waterbirds due to the reduction of major staging areas and feeding grounds on the migration routes. Work was supported by RFBR № 13-05-41392.



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**Deforestation and its Impact on Environment in Umtrew River Basin, North East India**

*Dhanjit DEKA, Pradip SHARMA (India)*

The pattern of forest cover has been changing more or less continuously in all parts of North East India. The changes have been accelerated in last few years partly due to natural causes and mainly due to human activities. The human activities including agricultural expansion, illegal felling of trees for timber wood mainly deplete the forest land and most of which in course of time turns in to agricultural land. All these changes have brought about many environmental as well as socio economic problems in the region. The trend of such changes and their impact on natural environment as well as on socio-economic condition of the people are identified as the prime concern at this stage. The Umtrew Basin of North East India is a river basin covering an area of 1253.1sq km where the study has been carried out using satellite data and GIS techniques. The satellite data of Landsat MSS and IRS-1C LISS III for the years 1977, 1999, 2004 and 2010 respectively have been utilized for the study. In the present study an attempt has been made to identify the pattern of forest cover change using GIS analysis through which we could identify the degraded areas. A humble starting from the Umtrew Basin for such programme with an aim to replicate in other similar areas of the country has been considered as the application part of the study. Key Words: GIS, Remote Sensing, GPS, Satellite imagery, Forest cover change, Afforestation, Umtrew



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**Changes in Livelihood of a Shifted Forest Village: A case study on Satargaon of Rani-Garbhanga RF, Assam, India**

*Pradip SHARMA, Mahfuza RAHMAN, Koichi KIMOTO (India)*

Natun Satargaon is one of the non revenue forest villages located in deep forest area of Rani Reserved forest located in Assam-Meghalaya state border. Dwindling forest cover, massive habitat destruction and animal killing in contiguous forests of Meghalaya have caused shifting of animals to forest of Assam part. Human population amidst the forest is also facing problem of livelihood support for decreasing production on the hill slopes where they traditionally practised shifting cultivation as well as forest resource gathering. Some of the forest villagers shifted to the valley areas and more particularly to Rani Forest area. Natun Satargaon is one of such villages which shifted about 6 km from Garbhanga Reserved forest to Rani Reserved forest. The present study is investigating how and why the forest village has shifted and what are the socio-economic and cultural issues related to such a shifting process. Historical background, causes of shifting, subsequent changes in new environment etc have been investigated based on extensive field visit. For detecting the changes in forest and overall land use cover, topographical sheet of 1967-68 and satellite images of 1987, 1999 and 2013 have been consulted. Nine land cover types were identified from the field observation. After classifying all the images, post classification comparison method was used to detect the changes in land cover types in the forests and their 5km buffer area. Interactions with the people and door to door survey using a questionnaire designed for the purpose have been used to understand the socio economic issues. Key words: Natun Satargaon, habitat destruction, shifting cultivation, livelihood

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**Re-Inventing A Traditional Green Product In The Contemporary Globalized World - Social Marketing Of Traditional Perfume 'Attar'**

*Soma SENGUPTA, Anjan SEN (India)*

Perfumes are alcoholic and chemical-based, and uses aerosol-based spray dispenser, which are not only a hazard to health but also to the environment. Though the Montreal Protocol (1989) envisaged phasing out of CFCs, yet they remain in use as aerosol propellants for perfumes and deodorants. A natural eco-friendly alternative of perfumes are attar, which are organic and non-alcoholic oil-based natural extracts derived from flowers, herbs, woods, etc. However, in the absence of an appropriate branding and marketing strategy, attars remain un-popular. People are reluctant to switch to attar because of several psychological factors. They believe that the product is used by a certain community; and its usage is not considered smart. The attars' fragrances are perceived as strong, and are believed to leave stains on clothes. Also, people are not aware about the eco-friendliness of attar vis-à-vis perfumes. Attar was popular in the orient since time immemorial for olfactory, aromatic and religious purposes. Today in India, it is manufactured as a handicraft and small-scale industry. Due to its high quality and reputation, attar manufactured at Kannauj (in the state of Uttar Pradesh in India) has been granted the status of Geographical Indication in 2013. Despite, state patronage and being an eco-friendly alternative to the billion-dollar perfume and fragrance industry, attar remains marginalized in India and world. The purpose of the present paper is to devise an effective social marketing strategy based on the Environment-Technology-Society (ETS) model to re-invent this green product, thereby preserving the traditional art of attar making, and boosting the local cultural economy.



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**Potential of Mountains Areas for Biodiversity Conservation in Swaziland**

*Ndumiso Cyprian MAGAGULA, Sizwe MALINDZISA, Maria C. PIRES, Dlamini PHILILE B., Sibusiso A. MALAZA (Swaziland)*

Historically, mountains areas in southern Africa have been relatively uninhabited parts of the land hence leaving them with very low disturbances by human interventions. In Swaziland, mountain areas have therefore remained intact as biodiversity hotspots in the wake of extensive land use changes in adjacent land. Although covering a relatively smaller surface area, mountain areas in Swaziland have a higher potential as biodiversity conservation areas compared to other non-protected areas. These areas naturally have very highly species-rich ecosystems and have been usually shunned for settlement and agriculture. Secondly, the areas are usually more immune from numerous drivers of land use change compared to adjacent areas. Moreover, their nationwide spatial distribution effectively covers more species than formally protected areas. However, there is an upsurge in the amount of pressure exerted upon the potential of mountain areas as biodiversity hotspots. The expansion of settlements, especially urban sprawl, has visibly reduced the amount of forested mountains in the country more so because of its unplanned nature. Over-utilization, insurgence of alien invasive plant species, soil erosion and unreasonably use of fire also form the myriad of threats to the conservation potential of mountain areas. Optimistically, the conservation potential of mountains areas can still be protected and enhanced. This requires a multi-disciplinary, multi-stakeholder and nationwide adoption of protective strategies and information sharing on both the importance of mountain areas (and their biodiversity pools) and the urgency of the need for maintaining their immunity from degradation as biodiversity hotspots.



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## Biomes of Russia: the experience of review bioecological mapping

*Tatyana KOTOVA, G.N. OGUREEVA, M.V. BOCHARNIKOV, I. M. MIKLYAEVA, S. V. DUDOV (Russian Federation)*

Mapping biodiversity on the basis of the integrated environmental approach is a special direction in the system of overview maps of nature. This approach can be implemented basing on the concept of biomes. Biomes entered the practice for biogeography studies, as the highest zonal ecosystem level when considering the biosphere as a whole. The new map "Biomes of Russia" (scale 1:7,5 m) is the first experience to display the patterns of spatial differentiation of biotic cover at the regional level. The classification of terrestrial ecosystems (Walter, Breckle, 1991) was taken as a basis for the map. The legend is organized in the following way: first level–zonobiomes and orobiome I-order; second level–geographic-genetic groups of biomes; third level (regional)–biomes. For each orobiome the spectrum of high-altitudinal belts are shown. 35 plains and 31 mountain regional biomes found the display on the map The main characteristics of biomes are presented directly on the map: 1) the structure of zonal and altitudinal belt vegetation and animal population; 2) parameters of climatic conditions–mean annual temperature, total temperature sum ($\sum t > 10°$) and the average annual rainfall (climate-diagram); 3) the number of plant species (vascular plants, bryophytes and lichens) and number of animal species (terrestrial vertebrates: mammals, birds, reptiles, and amphibians). For vascular plants the number of species is given as calculated for (a) the area-100 km2 and (b) the total number of species in the biome. Full characterization of regional biomes is given in the accompanying text to the map. Map of regional biomes can be a good basis for the consideration of biological diversity of biomes, their monitoring and protection.



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**Modern trends of vertebrate fauna changes in the zonal ecotone of the southern taiga and mixed coniferous-broad-leave forests at the Valdai Hills**

*Olga LEONTYEVA, D.M.GLAZOV, P.M. GLAZOV, L.A. KHLYAP, A.A. MEDVEDEV, V.I. NIKOLAEVA, A. A.TISHKOV (Russian Federation)*

Valdai Hills, located on the border of southern taiga and broad-leaved coniferous forests, is a part of the Eastern Europe end moraine landscape with high number of lakes. Valdai glaciation had significant influence on animals' diversity, habitats and distribution. New biogeographic boundaries were created. At the same time, centuries of the human activity had a great impact on the landscapes: deforestation took place. Forest-meadow-field landscapes with high biodiversity and quantity of rare animals appeared. Reverse trend took place in recent years: reduction of agriculture, disappearance of the villages and people; succession process started. Substantial changes in the regional fauna began. Modern fauna is heterogeneous, it reflects the specific conditions of each Valdai Hills' landscape. Habitat types differ significantly in terms of species diversity, general level of population density, species quantitative ratio. Fauna of Valdai national park includes 10 species of amphibians, 6 - reptiles, 216 - birds, 57 - mammals. Different changes in species composition and abundance are observed now. Some species reduce their number (Gavia arctica, Aquila chrysaetos. Pteromys volans, Mustela lutreola), others increase (Lacerta agilis, Castor fiber, Capreolus capreolus, Sylvaemus flavicollis). Some birds settled at the territory: Ciconia ciconia, Larus argentatus, Motacilla citreola , Acrocephalus arundinaceus, A. scirpaceus, Emberiza rustica. Three new species of birds are noted: Phalacrocorax carbo, Egretta alba,Cygnus olor. First of all landscape transformation led to transformation of the typical boreal fauna into a mixed type with significant role of the forest-field meadow species. Now biodiversity is changing as the result of forest-meadow-field habitats degradation.



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**Entomogeography: Past, Present, Future**

*Mikhail SERGEEV (Russian Federation)*

Main stages – from P. S. Pallas and P. A. Latreille till nowadays — and ways of development of entomogeography are characterized. Three general research programmes (sensu I. Lakatos), namely areology (areography), zonation, and regionalisation, are discussed. The roles of the regional (based on the uniqueness concept) and typological (resemblance/disparity concept) approaches are disputed. Some problems related to studies of insect ranges are evaluated. Requirements to create applicable range maps are emphasized. Relationships between the insect distribution patterns and the life zones are discussed. Peculiarities of zoning in entomogeography are noted, especially for pest and rare species. Special attention is granted to determine some principal intraspecific zones with uniform population distribution patterns. The role of geozoological investigations and opportunities of contemporary information technologies are characterized relative to evaluation of general patterns of insect assemblages' distribution. The problems of regionalization are discussed for entomogeography. Three main approaches to regionalisation (intuitive, a priori, and a posteriori) are determined. Some opportunities to use populations' and assemblage distribution patterns in regionalization are emphasized. The role and possibilities of entomogeographic researches in the field of reconstruction of past and long-term forecasting are characterized. Some examples of successfull long-term forecasts are discussed.



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**Development of representative network of Marine Protected Areas in the Russian Arctic**

*Boris SOLOVYEV, I. ONUFRENYA, D. GLAZOV, A. SAVELIEV, V. SPIRIDONOV, D. DOBRYNIN, A. PANTYULIN, E. CHUPRINA, N. PLATONOV (Russian Federation)*

The existing Marine Protected Areas (MPAs) in Arctic were designated via ad hoc step by step process. There are two related problems arise from such approach. The first problem is the bias in the representation of biodiversity towards some species or habitats that would result in a failure to protect other species that are often more in need of reservation. The second problem is a higher-than-necessary cost of achieving representative reserve systems, or, due to limited available resources, reduced likelihood of protecting many elements of biodiversity. High level of inter annual dynamics, high sensibility to climate changes, and the lack of data make protection of the Arctic ecosystem even more difficult task to be. Taking this into account, we have launched a project on scientific design of resilient and representative network of MPAs in the Russian Arctic. The objective of MPA network is to ensure adequate and fair representation of a suite of the biological and seascape diversity for the minimum cost taking into account the ongoing climate changes and social-economic development of the region. The key features of this approach are following: quantitative conservation goals, data on marine arctic species distribution and their habitats inventory, computer simulation techniques to identify sites need to be protected (Marxan software), collaborative work of key national and international experts, GAP analyses of existing MPA network, and transparent and quantitative results of the developed design. We expect that the conducted analyses will help us preparing recommendations for the development of resilient network of MPAs in the Russian Arctic for the government in 2016. We expect that this work can be transferred to the work of the Arctic council working group "Protection of the Arctic Marine Environment" (PAME) that has been tasked with looking into a framework for Arctic MPA networks.



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**Climate Change Impacts On Ecosystem And Biodiversity In Nigeria**

*Haruna Kuje AYUBA (Nigeria)*

CLIMATE CHANGE IMPACTS ON ECOSYSTEM AND BIODIVERSITY IN NIGERIA By H. K. Ayuba Professor of Environmental Science, Department of Geography, Nasarawa State University Keffi Nasarawa State, NIGERIA hkayuba@yahoo.com +234(0)8024523151 Paper for the International Geographical Union Regional Conference, Moscow (IGU2015) 18-22nd August, 2015 Abstract: The Convention on Biological Diversity (CBD, 2003) defines biological diversity (biodiversity) as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Many factors determine the biodiversity present in a given area at a given time. These include: the mean climate and its variability; the availability of resources and overall productivity of the site (measured in terms of the primary productivity and soil characteristics), including availability of adequate substrate, energy, water and nutrients; the disturbance regime and occurrence of perturbations of cosmic, tectonic, climatic, biological or anthropogenic origin; the original stock of biodiversity and dispersal opportunities or barriers; the level of spatial heterogeneity; the intensity and interdependency of biotic interactions such as competition, predation, mutualism and symbiosis and; the intensity and kind of sexual reproduction and genetic recombination. Climate change, as a major driver of biodiversity and ecosystem change today, is having profound and long-term impacts on human welfare and adds yet another pressure on terrestrial and marine ecosystems that are already under threat from land-use change, pollution, over cultivation, urbanization, industrialization and other perturbations.. At the global level, there are observed and projected impacts of climate change on ecosystems and biodiversity. In Nigeria, evidence of the impact of climate change on ecosystems and biodiversity abound from the Mangrove forest, the Rainforest through the Guinea savanna to the Sahel savanna. In recognition of the need to protect her biological resources, Nigeria has put in place a number of policies, programmes and projects; and regulatory frameworks over the years. However, the implementations of these policies and laws have been weak. This paper examines the status of biodiversity; the threats to biodiversity; selected impacts of climate change on ecosystems and biodiversity in Nigeria; the efforts being put in place to tackle the challenge and what strategic interventions are needed to sustainably address the problem of biodiversity loss. KEYWORDS: Climate change; Ecosystem and Biodiversity loss; Nigeria



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## Influence of lighting conditions on spectral and morphometric characteristics of Hordeum Vulgare

*Elena GOLUBEVA, Mikhail ZIMIN, Olga TUTUBALINA, I. SADOVAYA (Russian Federation)*

All types of vegetation, especially cereals, react to various changes, such as growth conditions, natural and anthropogenic factors. These first of all are reflected in the amount of phytomass, its fractional composition and, respectively, in its spectral signature. Spectral characteristics (spectral reflectance) of cereals allow to estimate an actual condition of crops on the basis of data processing of remotely sensed data and select the best parameters for plant cultivation. To reduce the number of variables influencing spectral characteristics of crops, we have conducted an experiment on influence of lighting conditions on growth of Hordeum Vulgare (barley). Measurements were made with ASD FieldSpec3 Hi-Res hyperspectroradiometer, intended for measurement of spectral radiance and reflectance. Barley was grown from seeds in bowls with identical nutrient solution during 10 days in uniform conditions of humidity, air temperature and convection. Three types of lighting were used: luminescent white, LED red and LED blue. In total more than 200 samples were measured. The most significant differences in reflectance were observed in the range of 750-1300 nm, which correlated well with phytomass of respective samples. There were also small differences in the range of 500-700 nm with samples grown under red light absorbing more radiation, than those grown under blue light. These data can be used in the future for monitoring condition of agricultural crops with remotely sensed data. The studies were conducted with the support of Russian Foundation for Basic Research (project 13-05-12061).



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## Changes of Wildlife Biodiversity in the European Russia (the End of the XVIII Century – XXI Century)

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The research in the field of environmental history examines the data on the fauna of European Russia in the late XVIII - early XIX centuries, contained in Economic notes (EN) to the General Land Survey, the largest land cadaster of imperial Russia, in comparison with modern data about its composition. Three classes of animals are mentioned in the survey materials: mammals, birds and fishes. Systematically processing the materials of EN, which cover the major part of European territory of Russia, we have compiled the sample database, covering 15 provinces, 102 counties, 1150 landownings, including more than 400 large and small rivers. It is integrated with the cartographic model compiled by means of the GIS package MapInfo. To date, the data on large mammals, as well as the most valuable fish - sturgeon (both generally and for individual species) are selectively analyzed. Data on the habitat of a particular species at the turn of XVIII-XIX centuries were mapped and analyzed in correlation with available data on the current distribution of these species. Some results are already published (Rumiantsev et al., 2013, 2014; Soldatov et al., 2014). It is shown that the ranges of most species of large mammals present in the study area two centuries ago, have not significantly changed since then, however, faunal diversity has grown substantionally due to the emergence of several new species. The habitat of sturgeon, in contrast, declined markedly as a result of anthropogenic impacts. Currently, the work continues on the analysis of historical changes in the distribution of mammals (as a whole and of individual species of particular interest) and valuable fish (salmon). Materials on birds are initially processed and prepared for analysis. Supported by the RNF, 14-50-00029.



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**A Research on the Features of Plant Diversity at Ebinur Lakeside Wetlands**

*Yanhong LI, Wang PANPAN,Yuan JIE, Jin LI (China (Beijing))*

Every 20 km along the 80 km-long lakeside of Ebinur, 5 sampling spots, were set 8 km away from the lakeside,, which are at Bo River, Bird Island, Duck Bay, the East Bridge, and Kuitun River; another 4 sampling spots were set away from the Bird Island Station at every 5km, 10km, 15km, and 20km respectively, on which investigations on trees, shrubs and herbaceous plants were conducted in May and October in 2012. The results show that: (1) In Ebinur wetland, 4 kinds plants of the grass family, 6 kinds of shrubs, and 61 kinds of herbs were found. Obviously, herbaceous plants are in a rich ground distribution there. (2) According to the calculations based on significant value, it is in boom season in May and October for plant communities, such as Suaeda, reeds, Halocnemum, and Haloxylon at the sampling spots at Bo River, Birdland, Duck Bay, the East Bridge, and Kuitun River respectively; while in October, it is dominated by the plant communities, such as Halocnemum, Crypsis Schoenoides, reeds and Karelinia Caspica, Populus Euphratica and reeds, Populus Euphratica and Black Lycium Chinense Miller at those 4 sampling spots every 5km, 10km, 15km, 20km along the Bird Island station. (3) changes in α diversity of plants along the lake: in May and October at the five spots the average of Margalef species richness index R is as follows: Bird Island> East Bridge> Duck Bay> Bo River> Kuitun River; in May the Simposon diversity index D, Shannon-Wiener diversity index H, and McIntosh (Dmc) evenness index are all in consistence as follows: East Bridge> Duck Bay> Bird Island> Kuitun River> Bo River; while in October it shows the largest index at Kuitun River sampling spot. In October, at a distance of Bird Island station along the lakeside, vegetation spots in different habitats with average Margalef species richness index R, Simposon diversity index D and Shannon-Wiener diversity index H, McIntosh (Dmc) evenness index all respectively showed the lake maximum value 15km away from the lake; (4) of four kinds of plant communities in different habitats, the biotope Cody index read higher and higher between Bird Island Spot I and II, and between Bird Island Spot II and III, while it reached the maximum value between Bird Island Spot II and III. It showed the similarity at highest level between Bird Island Spot I and II, and followed by Bird Island Spot III and IV; the heterogeneity showed best at Bird Island Spot II and III, and species replacement rate reached a maximum.



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**Series of soil properties maps in the Ecological Atlas of Russia**

*Maria GERASIMOVA, Maria BOGDANOVA, Tatiana KOTOVA (Russian Federation)*

Along with soils, separate soil properties are now exposed on special maps. In a number of National and regional atlases, such soil properties as acidity, texture, reserves and expenses of carbon, suitability for crops and non-agricultural land-use alternatives are shown. This trend is explained by both requirements of users and priority of soil properties in taxonomies. In the new version of the Ecological atlas of Russia, there are 10 soil-oriented maps compiled in agreement with the concept of Atlas. Their scales range from 1:20M to 1:40M, and they have a landscape-geochemical and environmental bias: geochemical barriers and milieus in soils, landscape-geochemical migration facilities and pathways, soil-geochemical processes; the environmental issues are disclosed in the maps of soil resilience to pollutants, soil degradation, as well as innovative maps of soil ecological functions, and Red Books of soils. Maps of soil properties sensu stricto comprise maps of hydrothermal and separately freezing-thawing regimes, organic matter characteristics, soil cover pattern. The majority of maps were compiled by the method of interpreting mapping units of a number of special maps, primarily, of the basic soil map and those of climatic parameters, relief, parent rocks, etc. The information capacity of maps is provided by matricial legends. Interpretations were derived from the knowledge on soils, pedogenic and landscape-geochemical processes and their bonds with the environment. Being mutually complementary, the maps compose an integrated system representing the world of soils as important ingredient and regulator of the changing environment.



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**Influence of Sea of Japan upon the Structure of Oak Forests in the Coastal Zone of the Eastern Sikhote Alin Mountains**

*Valentina MAKSIMOVA, Elena GOLUBEVA (Russian Federation)*

The Sea of Japan acts as an important environmental factor, developing the nature of the coastal land. Cold winds, constant high air humidity, fog, frequent drizzle, sea salt define particular qualities of the oak forests composition and structure. The height, diameter, lifetime of the oak (Quercus mongolica) – being an aedificator species – decreases with approach to the coast. The strongest influence of the sea affects the narrow up to 300 m strip, where the formative factor influences the forest stand to a great extent, transforming it to a bush form, not typical to above species. Significant differences were specified also in grass layer structure of coastal zone woods. It become floristically and ecologically more diversified, compared to the continental ones, characterized by the presence of groups of plants, which are not normally typical to oak woods, such as halophytes, xerophytes, succulents. Within the strip from 300m to approx. 5 km inland the sea influence is saved, but weakly expressed, as evidenced by morphological parameters, while Quercus mongolica produce two-or-three trunk form. The sea universalizes the environmental conditions all over the coastal zone from the north to the south, making the grass cover of oak forests floristically similar to a high degree along latitudinal gradient. Behind the coastal zone environmental sea influence is negligible, the latitudinal position comes to the fore. Abovementioned data demonstrate the dominant role of the sea as a potent ecological factor, therefore could be applied while allocation of boundaries between marine and continental conditions.



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**Identification of vegetation types and ecosystems associated with atlantic forest in the Ilha Grande, Rio de Janeirostate, Brazil**

*Yame Medina RAMOS, Heloisa Helena Gomes COE, André Luiz Carvalho da Silva, Emily GOMES, Leandro de Oliveira Furtado de Sousa (Brazil)*

Ilha Grande ("Big Island")is located in the southern of Rio de Janeiro State, Brazil. The predominant vegetation is the Atlantic Forest, a complex and exuberant set of ecosystems, which include a significant portion of the Brazilian biodiversity. Unfortunately, it is also one of the most threatened biomes in the world due to the constant destructionsand irregular occupation. Originally, the Atlantic Forest covered approximately 15% of Brazilian territory, nowadayswe have only 7% of the original cover, in an area where lives about 61% of the population.Ilha Grande's landscape ismade up of a mosaic of vegetation types of the Atlantic Forest domain, as "restinga", mangrove, rocky shore plants and hillside forest at different levels of regeneration.We delimited its distinct ecosystems and identified the more frequent species found in each one of them. Originally, the islandwas almost completely coveredbya dense tropical rainforest. The landscape was quite modified by different agro-economic cycles (coffee, sugar cane, vegetables, fruits, grains and cattle breeding). Presently, the northern part of the island is covered mainly by degraded vegetation. In the southern side, as well as the geographical center of the island, the forests are in better condition.The island has 193km2 and about 80% of this area is included in the State Park of Ilha Grande, formed by three protected areas: theEnvironmental Protection Area of Tamoios, the Biological and Archaeological Reserve of Praia do Sul and the Marine State Park of Aventureiro. All this protection assists in maintaining the integrity of these environments but do not prevent them to be degraded. It is necessary to highlight the importance of researches aiming to know and preserve this environment. Key words:IlhaGrande, Atlantic Forest, ecosystems, Brazil



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**Invasive Species and Fire: A Double Blow to Biodiversity Conservation in Southern Africa**

*Sibusiso MALAZA, Candice GREENLAND, Siphumelele NKOMO, Philile DLAMINI, Fadzai PWITI (Swaziland)*

Land degradation in Southern Africa; in the wake of climate change, land conversion and policy failure; is rife and worsening. Invasive Alien Plant Species (IAPS) and fire are emerging as serious threats to environmental sustainability. AIPS had outcompeted numerous important species and fire is usually used recklessly to manage IAPS. These interlinked problems interact with both the environment and each other to form a system of biodegradation activities especially in rural areas. Research is essential for understanding these threats and the ways through which they can be overcome hence this research intended to assess the spatial distribution of IAPS and fires in Southern Africa; to evaluate the threat they pose on the conservation of biodiversity; to ascertain the nature of responses that would be necessary to overcome the threat and; to evaluate the region's capability of implementing working strategies for the eradication of this threat. Literature on IAPS and fire in Southern Africa has been reviewed and surveys used to fill gaps in the literature and communities' responses to the problem. Preliminary findings indicate that IAPS and the irresponsible use of fire are eminent threats to the conservation of biodiversity in Southern Africa. About 20% of the total surface area is affected by either of the two threats or a combination of both. Furthermore, IAPS and fire usually affect mountains, the biodiversity hotspots in the region, hence threatening the sustained existence of a number of species some of which are endemic to the affected areas. There is a general lack of proper responses to the IAPS and fire threats hence the continued expansion of the problem in the region thus increasing the chances of species disappearance and extinction.



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**Variability of phytoplankton community of north-eastern Black sea caused by natural and anthropogenic factors**

*Antonina POLYAKOVA (Russian Federation)*

Investigated the interannual and seasonal variability of phytoplankton coastal north-eastern part of the Black Sea: species diversity, abundance and biomass depending on the variability of hydrological and hydrochemical conditions and pollution. Phytoplankton community was studied for more than 10 years as an example of Gelendzhik Bay. Interesting results were obtained by analyzing the species composition and biomass of phytoplankton, depending on the severity of the winters. In cold winter in 2008, flagellates algae Dinolagellatae was dominated in phytoplankton (81, 4 %). In abnormally warm winter in 2009 large diatoms were dominant in phytoplankton, the main part of whom were algae biomass Rhizosolenia calcar-avis (80%). Flagellates were presented Peridinium. Large diatoms and flagellates are more resistant to contamination. From 2009 to 2011 diatom algae Rhizosolenia calcar-avis was dominant in the phytoplankton community. This phenomenon is due to significantly to the nutrient status of the base. With a decrease of the silicates concentration in the summer and winter 2012-2013 biomass Rhizosolenia calcar-avis sharply decreased to natural values. This led to the restoration of the natural phytoplankton species composition of the Black Sea. Winter and summer 2014 the rich silicates water came from the open sea. This fact again promoted mass flowering Rhizosolenia calcar-avis. Traditional for Black Sea species of algae Licmophora, Sceletonema, Peridinium in summer 2014 were underrepresented. Quantitative development of diatom Rhizosolenia calcar-avis is a good indicator of natural conditions fluctuations in the coastal area of the north-eastern Black Sea and anthropogenic impacts on its ecosystem.



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# C12.06 Cold Region Environments

## Resources, Well-Being and Sustainable Development 1

**Chairperson(s):** *Andrey Petrov, Tatiana VLASOVA*

- Sustainable development in Arctic, cold and remote regions: past and future research milestones

  *Andrey PETROV (United States of America), Peter SCHWEITZER (United States of America), Gail FONDAHL (United States of America)*

- Coping with Uncertainty in a Changing Community Landscape: Resilience to Natural Resource Development in the Timan-Pechora Province.

  *Julia LOGINOVA (Russian Federation)*

- Sustainable Urbanism in Tasiilaq, Greenland

  *Vlad LYAKHOV (Norway)*

- Transformation of human settlements in Northeast ethnic regions of Russia and its relation to natural resources use

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- Cities of the Russian Arctic: population change and migration patterns in the post-Soviet period

  *Evgeniy DENISOV (Russian Federation)*

## Resources, Well-Being and Sustainable Development 2

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*Svetlana AGAFONOVA (Russian Federation), Natalia FROLOVA (Russian Federation)*

- Food and water security monitoring in the Arctic: approaches and indicators

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- Post-soviet transformation in Chukotka District: challenges and prospects of industrial development and traditional nature management

*Evgeny ANTONOV (Russian Federation)*



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- Investigation of thermokarst lake dynamics in various regions of Russian cryolithozone using satellite images

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  *Alexandr PASTUKHOV, Dmitry KAVERIN, T. MARCHENKO-VAGAPOVA, N. GONCHAROVA (Russian Federation)*



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  *Vadim GRIGORIEV (Russian Federation)*

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- The role of soils composition, structure and properties in formation of temperature regime and active layer thickness on west coast of Baydara bay

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- Sea level fluctuations in the small inlet of the White Sea according to observations in 2008 – 2014

  *Alexey KONDRIN (Russian Federation)*

- Sedimentology of thermokarstic lakes: Terekhol Lake, Southern Siberia

  *Yulia FUZEINA (Russian Federation)*

- The role of variability of climatic conditions and snow cover's thickness in the change of freezing depth of the underlying ground

  *Denis FROLOV (Russian Federation)*



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- Sedimentology of thermokarstic lakes: Terekhol Lake, Southern Siberia

  *Yulia FUZEINA (Russian Federation)*

- Analyzing winter activities of wild Taimyr reindeer using Argos satellite collars

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- Characteristics of active-layer deposits of Schirmacher Oasis, Eastern Antarctica

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- Nature management and ecosystem degradation in the Russian Arctic

  *Alexander EVSEEV (Russian Federation)*



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**Sustainable development in Arctic, cold and remote regions: past and future research milestones**

*Andrey PETROV (United States of America), Peter SCHWEITZER (United States of America), Gail FONDAHL (United States of America)*

Sustainable development research in Arctic, cold and remote regions seeks to understand the character of interactions among society and nature in these challenging and changing environments. In the recent years scholarly work in Arctic sustainability and sustainable development are developing along three pathways: scientific discussion of what sustainability (including sustainable development) means; political discussion of the agenda for sustainable development, from local to global scales; and promoting social learning of actual nature-society interactions in order to guide humanity towards sustainability. Since the IPY there have been a number of studies that unraveled and articulated the meanings and manifestations of sustainable development in various Arctic regions. There have also been examples of practical applications of some sustainability principles to development in selected communities and regions. Certain aspects of sustainability, such as the notions of resilience and adaptation, received particular attention from both scholars and Arctic residents. The growing knowledge base and interests to Arctic sustainable development issues brought about the emergence of a new science, the Arctic sustainability science with its knowledge base expanding to other cold and remote regions. However, despite advancements of research in recent years, our understanding of the complex structures, functions and interactions within or among socio-ecological systems across this region is still incomplete as it lacks synthesis. In other words, the patchwork of sustainability knowledge in the Arctic is yet to evolve in to the framework that provides a comprehensive understanding of Arctic social-ecological systems. This paper summarizes the findings of the International Arctic Science Committee's white paper on Arctic Sustainability Research and opens the discussion of opportunities to develop an Arctic/cold/remote regions-oriented sustainability science conceptual framework.



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## Coping with Uncertainty in a Changing Community Landscape: Resilience to Natural Resource Development in the Timan-Pechora Province

*Julia LOGINOVA (Russian Federation)*

Sustainability of many communities in Russian Circumpolar North has been affected by critical changes in natural resources, industrial development or government policies. Aggregate or regional statistics often present a depressing picture. However, at the local level many communities have developed own strategies to cope with and adapt to changing conditions, sustain their livelihoods and fight back against institutionalized insecurity. This paper examines community responses to a changing environment through the theoretical lens of community resilience. The paper adopts an integrated approach to community resilience, incorporating aspects of adaptation to change and coping with uncertainty. The specific focus is on how formal and informal institutions and their interplay across scales impact community resilience. The study focuses on communities and livelihoods along Pechora River in northern Russia and their response to environmental changes associated with natural resource development in the area. Their experiences may offer important lessons for understanding sustainability and resilience of northern communities in general.



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**Sustainable Urbanism in Tasiilaq, Greenland**

*Vlad LYAKHOV (Norway)*

Life in Tasiilaq (Greenland) is pretty much different from life in European cities. It has its specifics in local economy, climat, in its very limited transport accesibility and hardness of logistics, it has a very short shipping seasons after which the main source of deliveries stops. These specifics of lifestyle demand special requirements for urban development, for housing and socio-territorial organization. Most of their needs local people got used to fulfill by themselves. For example, the miscorrespondance of typical european houses to their everyday's needs they tend to fix by themselves. Handmade solutions surround people all over Tasiilaq. One can find them in the streets, in local public spaces, port, and in and around every house in the city. It is that simple: people need some functions which they lack - they solve the problem by themselves. Non-professionally of course. And no need to say, that this kind of informal soultions have not the best aesthetic quality and exploitational quality.



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**Transformation of human settlements in Northeast ethnic regions of Russia and its relation to natural resources use**

*Tamara LITVINENKO (Russian Federation)*

Reflecting the post-Soviet change in population dynamics and its relationship with ethnicity and natural resource use, distinct types of transformation of human settlements can be found in northeast regions of Russia: (1) the Soviet-period settlements, inhabited largely by indigenous population, whose numbers have not changed much;(2) the Soviet-period settlements, but considerably depopulated, inhabited mostly by Russian population; (3) considerably depopulated settlements, with essentially Russian population, where there co-exist abandoned and preserved residential neighborhoods forms; (4) abundant settlements that used to be inhabited by non-indigenous population employed at mining enterprises;(5) temporary workers' settlements that are emerging due to the opening of new enterprises based on mineral resources use. In northeast ethnic regions may be observed differences in spatial transformations between settlements with a predominantly indigenous population (they have been preserved) and Russian population (such settlements have been either demolished or preserved and considerably depopulated). Human settlements with a greater share of indigenous people employed in traditional natural resources use have undergone relatively smaller transformations, and settlements with higher share of non-indigenous population and well-developed mining were among the most-transformed. Human settlements of northeast regions of Russia have changed in the post-Soviet period and are continuing to evolve under the impact of population dynamics and natural resources development.



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**Cities of the Russian Arctic: population change and migration patterns in the post-Soviet period**

*Evgeniy DENISOV (Russian Federation)*

One of the Russian Arctic features is its relatively high and dense population in contrast with other northern countries. In the early 1990s the socio-economic situation in the region has worsened a lot due to the structural economic crisis. As a consequence, the demographic and migration trends in the northern cities have changed significantly. At the present stage mobile methods of work organization became more popular. Cities of the region differs by demographic trends during two intercensal macroperiods. The most numerous is the group of cities with the demographic dynamics changeover in the early 1990s. Cities of the second group maintained a positive population growth rate during both macroperiods. There is also another small group – settlements which have been losing the population during the both periods. During the post-Soviet period migration trends in the Northern regions have changed dramatically. In the early 1990s the latitudinal migration situation gradient was typical for the North: outflow rates decreased from North to South. At the same time there also was an East-West gradient within the North. Instead of interregional macroscale gradients like East-West and North-South there are nowadays widespread intraregional center-peripheral gradients in most parts of the North (more positive situation in the regional capitals). There are several positive demographic trends factors nowadays: regional capital status, economic sustainability, total population and its age structure. Territory serving functions are becoming more important for the cities development as traditional economies declines. Cities economies transformation helps them to adapt while overall population declines.



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**River ice breakup and ice-jam events in the European Russia under climate change**

*Svetlana AGAFONOVA (Russian Federation), Natalia FROLOVA (Russian Federation)*

Research of ice regime Russian rivers is an important scientific and practical task due to specific of geographical location and climate conditions of the country. Ice phenomena are observed on rivers of the European territory of Russia (ETR) annually during 5 month and more. In the ETR the rise of air temperature in the cold season has resulted in more frequent winter thaws. In recent decades a significant change of spring flood features has observed. In the rivers of the north of the ETR the features of spring runoff didn't change significantly. But a decrease of the maximum discharges of the spring flood in the Volga and Don drainage basins is typical. In the current study hydrological information about the river ice break up period was analyzed. This information was based on data from more than 300 hydrological stations on the rivers of the ETR and was enabled the elevation of changes in characteristics of spring ice run and ice jam. Two periods were used for analysis: 1940 – 1975 and 1976-2011. Research of the river ice change caused by climate change was conducted for whole ETR and for the main hydrological regions. In the rivers of the north of the ETR break up date didn't change significantly, but frequency of ice break up hazard increased. In the Volga river basin early ice run are observed even more often. During break up period ice floes were replaced by slush ice and ice jams were replaced by hanging ice dams. Break up occurs 5–10 days earlier. In the Don river basin ice run isn't observed, but ice decays in place. Break up occurs 10–15 days earlier. For south of the ETR ice cover period wasn't observed. Long winter thaws divide ice season into 2 and more parts. This study was supported by the Russian Science Foundation (grant No. 14-37-00038).



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**Food and water security monitoring in the Arctic: approaches and indicators**

*Tatiana VLASOVA (Russian Federation), Sergey VOLKOV (Russian Federation), Alexander KHROPOV (Russian Federation), Ivan LYTKIN (Russian Federation)*

Food and water security in the Arctic has become one of the most urgent issues in the Arctic that need to develop solutions. It needs multidisciplinary approaches for understanding and identification of key variables to monitor. Indicators for food and water monitoring in different regions of the Arctic states, such as Canada, the USA and Russia has started to be developed within the international "ASUS: Arctic sustainability: synthesis of knowledge" project co-funded by the Russian Foundation for Basic Research. Approaches for such problem-oriented monitoring network construction are discussed in the paper. One of the main principles of such monitoring network construction is the involvement of traditional and local knowledge, its integration with the science and building education capacities. The preliminary list of key indicators for food and water security monitoring is provided including: economics-Cash/Subsistence economy, government subsidies, access to traditional food and its harvest, access to markets, health of wildlife and biophysical environment, changes in sea ice, rights of indigenous and local people to access land and to protect the land and water, sharing community systems and others.



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**Post-soviet transformation in Chukotka District: challenges and prospects of industrial development and traditional nature management**

*Evgeny ANTONOV (Russian Federation)*

After the collapse of the Soviet Union Chukotka District has experienced fundamental changes that affected all spheres of life. The most important sectors of the economy – mining and traditional nature management (mainly reindeer raising, sea mammal hunting, hunting) have severed the strongest decay. Dramatic trends in the economy were accompanied by mass migration, closure of enterprises and settlements. The region had to adapt itself to new conditions of the post-Soviet economy. Some industries remained competitive and provided economic stabilization and slight development of the region in the 2000s. Analysis of the regional socio-economic situation in 1991-2014 years, based on the compilation of extensive statistical material and review of studies, was completed. After the socio-economic transformation and adaptation Chukotka District demonstrates stabilization of the socio-economic condition in the recent years. The negative trends in demography and traditional nature management were smoothed after the mid-2000s because of favorable market conditions for the main product of Chukotka – gold. Fundamental problems of the reindeer industry, fishing and hunting imply that the existing system of traditional nature management remain unsustainable and critically depended on the state support. The work presents forecasts of social-economic development of the region and specific aspects of its life in perspective 2020-2030. The work is part of the research project "Adaptation Actions for a Changing Arctic – Part C"



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**Bringing together Naskapi, Inuit and Scientific Observations of Changing Inland and Coastal Ice and Climate Conditions in North-Eastern Canada**

*Marie-Jeanne Sarah ROYER , Thora Martina HERRMANN , Oliver SONNENTAG , Alain CUERRIER , Fanny PAYETTE, Michel REPINSKY (United Kingdom)*

Increasing recognition of the climate change process has led to a growing interest in the ways Aboriginal communities in Polar Regions observe and monitor climate, through traditional knowledge systems. Local observations and monitoring practices are increasingly recognized by scientists as a valuable data source which can enhance scientific studies of climate change in northern regions. In the Naskapi and Inuit communities of North-Eastern Canada, local climate-sensitive variables (e.g. snow, ice) play a key role in land and in coastal ocean use as they can impact fishing, hunting, trapping and harvesting. Naskapi and Inuit have observed long-term changes in seasonal and annual weather conditions, ice thickness, snowfall, wind, freeze-up and breakup of river, lake and sea ice, and in climate hazards phenomena. This paper draws on community workshops, interviews and questionnaires carried out with the Naskapi Nation of Kawawachikamach and the Inuit villages of Kangiqsuallujuaq and Nain in order to document coastal and inland communities' observations of changes to sea ice, snow melt, breakup of the river/lake ice, wind and local climate conditions. Long-term climate data is available from 1913 to 2013. Using climate modelling, we analysed frost days, minimum temperature (Tmin), maximum temperature (Tmax) and precipitation (Sdepth). By contrasting Naskapi and Inuit observations with climate modelling data, we reveal several changes in local climate and ice conditions along a coastal-inland gradient. We conclude that traditional knowledge as local-scale expertise and scientific knowledge are the ideal complements to understanding and addressing the complexities of climate change in the Sub-Arctic, helping to make polar research more pluralistic.



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IGU2015 – 3814

## Tourism in the Arctic and Antarctic

*Iurii GOLUBCHIKOV, Olga MARKOVA, Vladimir TIKUNOV, Irina TIKUNOVA (Russian Federation)*

The polar regions of the Arctic and Antarctic is a land rich in natural resources and beauty. At the same time, their nature is very vulnerable to any human impact that is associated with extreme conditions of existence of living organisms. This is especially true for Antarctica as the polar continent with significant heights and most severe on the Earth climate and ice conditions. Thus it is necessary to divide the natural conditions of the entire Antarctic with other areas of the World ocean and the most stringent conditions for domestic, continental parts of the continent South Pole. Sustainable development of these regions is primarily due to tourism, scientific research, environmental protection, and international cooperation. The area of the earth's poles are to become valid regions of the world. Over the last two centuries, the world community has largely advanced in the study of the polar continents, the discovery and the description of their territories and the natural world. A great contribution in this area is owned and Russian science. According to the research results generated maps, including fundamental atlases of the Arctic and Antarctic, which fully reflects the information about the geography, history, development, natural resources in the polar regions. Currently, the task organization cartographic databases on the new GIS-based, update old maps, many of which were created decades ago. These cartographic database must be available to the international community of polar researchers and a wide range of experts in the field of natural Sciences and Humanities, photographers, artists, and lovers of polar travel. In addition to the map information, they may contain scientific and popular texts and illustrations - paintings, photographs, scientific illustrations and drawings. Databases can be widely available using the Internet. The main factor of human presence in many high-altitude and high-latitude areas is tourism. The number of tourists from both polar regions is increasing annually. In the Arctic and sub Arctic arrives about 5 million tourists. Antarctic tourism has grown from a few hundred visitors in 1967 to 46 000 in 2008/09 and 35 000 visitors in 2012/13 [IAATO, 2013]. Tourists make up about 80% of all annual visitors to Antarctica. They spend on its shores from 1 to 5 hours, mainly in the 13 points of the Antarctic Peninsula during the period from 2 to 3 weeks [Mortimer, 2004]. It is predicted that in the near future tourism will take on Svalbard and in Alaska the same position as in the Mediterranean or the Caribbean [Snyder, Stonehouse, 2007; Amadeo, 2009; Maher, 2007;]. One of his lines will be associated with the places of past routes of famous explorers and visit the most remarkable places. We have compiled a series of maps of the routes of early explorers, which will also become places of attraction for tourists.



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**Volumetric thermohaline analysis of the Barents Sea waters**

*Sergei MUKHAMETOV, Victor ARKHIPKIN (Russian Federation)*

One of the major objectives of the studying the World Ocean and its parts now is determination the average thermohaline characteristics of individual water masses and seas in general. In this paper, based on climatic dataset of oceanographic data were determined average values of temperature and salinity at standard levels in the Barents Sea and throughout its volume. Average thermohaline characteristics obtained as an average for the year and for each month separately. An volumetric T,S-analysis of the Barents Sea and on its basis are highlighted volumes, heat content and the amount of salt for each selected water mass for different seasons. This water area was nonaccidental selected for analysis. The dynamics of the Barents Sea makes a decisive contribution to the formation of its oceanographic fields. This sea is essentially a link to the water exchange between the Atlantic and Arctic oceans. The Barents Sea is located on the shelf of the Arctic Ocean between the northern coast of Europe and the three groups of large islands - Novaya Zemlya, Franz Josef Land and Spitsbergen. Sea borders in this paper were calculate carefully with instructions of the International Hydrographic Organization. To calculate the volume of the Barents Sea water was taken from the bottom of the one-minute relief IHO - Data Centre for Digital Bathymetry. To calculate the volume of thermohaline characteristics of the Barents Sea, we used data climatological atlas of the oceans - WOA 2013 vol. 13 - Climatological Atlas of the Nordic Seas and Northern North Atlantic of the National Oceanographic Data Center (NODC).



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**Large-scale climate anomalis over Eurasia: astrogeographical analysis**

*Alex RETEJUM, Kirill DIAKONOV (Russian Federation)*

We propose the astrogeographical approach to study large-scale climate anomalies over the continent based on the dendrochronological data. The first stage begins with gathering tree ring information. The present study is based on multiyear data obtained from the Russian Federation and more than a dozen other countries. The second stage involves chronological survey. It was found that widespread droughts have happened simultaneously in some chain years. The final stage focuses on the analysis of relationship between the Eurasia's climate and positions of outer planets which impart significant impact on the Earth rotation, solar activity and cosmic ray. The standard deviation of planet's geocentric longitudes in times of drought as a rule is much smaller then normal one. Keeping in mind this important observation one we to the conclusion that the drought risk in regions of Asia would be relatively high in 2015/2017.



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**Supercooling Of Seawater Near The Glacier Front In A Fjord Analysis**

*Aleksey MARCHENKO, Eugene MOROZOV (Norway)*

We analyze seawater temperature and salinity in the immediate vicinity of the Paula glacier front in Spitsbergen. The CTD-measurements were carried out from ice in winter and from a boat in summer. ADCP profiling was performed near the glacier front from the ice in winter. In winter, we found water with lower salinity than the surrounding water in the fjord at a distance of 15 m from the glacier front and registered small upward water flux near the bottom. The relatively fresh water was found at a depth of 2-4 m in the place where the sea depth near the glacier was 17 m. Supercooling of the freshened water reached 0.35°C. We link this phenomenon to a flow of freshwater from under polythermal glacier, which becomes overcooled in the seawater with significantly lower temperature and higher salinity. The effect of supercooling due to the influx of fresh water at the freezing point into salt water at its freezing point was registered in the experiment in cold laboratory of the University Centre in Svalbard.



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## Sar backscatter model inversion for estimation of stratigraphic snow along the Union Glacier – Antarctica

*Jean Marcel de Almeida ESPINOZA, Jorge ARIGONY-NETO, Ricardo JAÑA (Brazil)*

The general purpose of this study was to develop a model radar SAR backscatter on the analysis of surface snowpack. This was based on the physics of the interaction between microwave vs. snow, applied the Cosmo-SkyMed-X data to obtain stratigraphic data Snow indirectly. Therefore, this study developed an analytical solution for the process of interaction between a beam of microwave band X and the surface snow pack allowing to estimate indirectly the morphology of the factors analyzed snow cover. As study area, was delimited Antarctic western portion, next to Union Glacier area. This choice was made because of Antarctica comprise a region where there were some of the most significant changes on the glacial systems for decades and for being this poor region of systematic glaciological monitoring, something that can be mitigated with the use of sensing data Remote. The proposed model backscattering afforded stratigraphic data for snow shaped (ie, the average thickness of the layers of snow, medium snow surface density of the package and average grain size of the snow), allowing the inference of the local variables from stratigraphy Cosmo SkyMed data-band X. For verification purposes this modeling were considered common input data, made up of stratigraphic data and snow temperature profile in a 2m deep collected over a Antarctic summer. This work brings a contribution the development of a new model of radar SAR backscatter facing dry snow to obtain stratigraphic data from radar SAR backscatter data.



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## Temporal variations in the fine structure of the middle atmosphere according to acoustic sounding data

*Sergey KULICHKOV (Russian Federation), Igor CHUNCHUZOV (Russian Federation), Gregory BUSH*

Temporal variations in the fine layered structure (vertical scales 10m-1km) of the middle atmosphere (20--120 km) have been studied on the basis of data obtained from acoustic sounding within the range of infrasonic waves. Surface explosions equivalent to 10kg --70 t of TNT were the sources of infrasound. These explosions were set off in different regions of Russia during different seasons. Data obtained from the 1981--2011 experiments have been analyzed. It has been found that the middle atmosphere has a fine layered structure during all seasons. It has been found that, on the whole, the vertical distribution of temperature and wind-velocity inhomogeneities, which are characteristic of the fine structure of the middle atmosphere, can be stable over a period of no less than a few hours. It has also been found that the numerical values of both layered temperature and wind-velocity inhomogeneities (absolute values, vertical gradients, etc.), which characterize the fine structure of the middle atmosphere, can be constant over a time period of no less than 10 minutes. The data obtained suggest the presence of stable layered inhomogeneities in the middle atmosphere within the range of vertical scales from a few tens of meters to several kilometers.



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**Glaciers of Chukotka (Northern Far East of Russia) – assessment of the present state and projection by a regional model scenario**

*Maria ANANICHEVA, Andrey KARPACHEVSKY, Vladimir PLATONOV (Russian Federation)*

Satellite imagery of high resolution is used to identify relatively small glaciers of Chukotka and Kolyma highlands (Northern Far East of Russia). The results are compared with the inventory made by R.M. Sedov in 1980s. The regional non hydrostatic atmospheric model COSMO-CLM is involves for the detailed assessment and projection of Chukotka mountain glaciers and other cryospheric objects, runoff from the mountains, etc. The resolution 2.8 km is used as the highest horizontal resolution of the COSMO-CLM model. Initial conditions are derived from the global MPI-ESM-LR climate model, which is included in the CMIP5 project. According to (Anisimov, Kokorev, " Ice and Snow", 2013), the MPI-ESM-LR satisfactorily reproduces the main meteorological variables (such as temperature, precipitation, etc.) for this region. At first, the COSMO-CLM run is executed for many years from 'historical' experiment data of MPI-ESM-LR (historical-r1i1p1). We suppose to yield robust relationships between the distribution of temperature and precipitation over 'mountain grids' from detailed simulation and the distribution of the same parameters on the coarse data grid (from MPI-ESM-LR model). After that, we will calculate the cryospheric objects' parameters and conditions, according to the method (Ananicheva, Krenke, Barry, the Cryosphere, 2010) Based on these relationships, we suppose to extrapolate it to the periods (around 2030 and 2080). In other words, we want to estimate the Chukotka climate and cryospheric objects state for the future supporting our relationships based on the accessible coarse MPI-ESM-LR output data.



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## Investigation of thermokarst lake dynamics in various regions of Russian cryolithozone using satellite images

*Valentina KRAVTSOVA, Tatyana RODIONOVA (Russian Federation)*

Thermokarst lakes dynamics is arguably an indicator of cryolitozone reaction to climate warming. Recent studies show various results, which are interpreted as thermokarst activization but it could be also due to errors. We have developed a method for reliable measurements of thermokarst lake area changes and applied it for various regions, taking in account regional factors. The method compares multitemporal Landsat images, taken throughout the warming period from the 1970s. Different resolution of images forced us to exclude small lakes from analysis, and to use maps (rather than total area statistics) to analyse geographic distribution of emerging and disappearing areas of water. We investigated nearly 40 test sites in all 6 regions of Russian cryolithozone and compiled 40 maps of thermokarst lakes dynamics with over 300 000 lakes. In total we observe small and variable dynamics for 1970-2000 – some lakes decreased (by 2.9%) and some increased (by 1.2%). Mass area decreases were due to drainage of lakes by rivers. Lakes increases were due to activisation of thermokarst in regions with highly icy permafrost (Yamal, Yana-Indigirka lowland). Filling up by rivers acts everywhere, especially at Kolyma lowland, Yana and Indigirka deltas, Transbaikal hollows. Cyclic changes of precipitation control lakes dynamics in CentralYakutia. Anthropogenic impact caused lakes changes in regions of oil and gas extraction in Western Siberia. We conclude that thermokarst lakes dynamics is controlled by multiple factors and so cannot be used as an indicator of climate warming impact at cryolitozone.



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**Unique Holocene massive ice, the north-eastern Yamal Peninsula**

*Yurij VASIL'CHUK, N. BUDANTSEVA, A. VASIL'CHUK (Russian Federation), J.CHIZHOVA, Y. PODBORNY, A. SULLINA (Russian Federation)*

Unique Holocene massive ground ice drilled in detail for the first time on the coast of the Gulf of Ob (also known as Ob Bay) near the Sabettayaha mouth. This area presents syngenetic permafrost for lagoon-marine deposits located in the zone of high tides and surges of water of the Gulf of Ob. Massive ground ice is so commonly distributed in the Holocene strata of this area - unusual and extremely rare in permafrost in general. Massive ice bodies that have capacity up to 5.7 m occur in the Holocene sediments of modern lagoon-sea floodplain and the first terrace and they undoubtedly also have the Holocene age. Due to the stable isotope and pollen spectra analysis it is shown that massive ground ice is mostly autochthonous type and segregated origin. Massive ice bodies were syngenetically formed in Late Holocene during freezing of water-saturated grounds, intensive cryogenic fractionation lead to significant stable isotope variation in the ice. Very low values of deltaD and delta18O of the massive ice are unique not only for Holocene ground ice of Yamal Peninsula, but even for significantly isotopically light Late Pleistocene ice wedges and for massive ice of the northwest of Siberia. This work was financially supported by Russian Scientific Foundation (grant RSF № 14-27-00083)



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**Title Reconstructing glacier retreat since the Little Ice Age (LIA) in the Himachal Himalaya, North-Western part of India: an overview and specific examples**

*Pritam CHAND, Milap Chand SHARMA, Sachin KUMAR (India)*

The Himalaya comprises one of the largest glacier-covered areas outside the polar-regions. Several studies reported that Himalayan glaciers responded to the global cooling associated with the Little Ice Age (LIA), however, there is no realistic estimate to suggest how the recession occurred after the termination of this globally important climatic event with few exceptions. Besides, the pattern of deglaciation following the LIA is important towards understanding the role of natural verses anthropogenic contribution in glaciers response, considering significant debate pertaining to the rising global temperature and its likely impact on the mountain glaciers (IPCC, 2007). Thus, the present study document, analyse and reconstruction the fluctuation of index glacier (based on glacier location, size, geometry, characterise of debris cover and their geomorphology) located in the Himachal Pradesh, North-Western Himalaya since LIA maximum advance using historical records, repeated photographs, remote sensing data and field observations including geomorphological evidence. Preliminary results shows the general state of glacier retreat since the end of LIA with varying recession rate from one glacier to other. The study suggest that the post-LIA retreat was most likely triggered by climatically induced changes during the 20th century however the varying retreat rate can be attributed to the influences of topographical factors and the nature of debris cover. Further analyses are under way by incorporating the glacier ELA calculations, volume estimations and short to long term in-situ and geodetic glacier mass balance measurements to look into the overall response of climate and topography on the glacier dynamics in different climatic zone of this region. Besides, the limitation and applicability of historical records, repeated photographs and remote sensing data for reconstruction of long terms glacier fluctuations especially for the Himalayan region will be addressed.



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**Hydrological processes in post-fire permafrost environment: the case study of mountainous watersheds in Eastern Siberia**

*Nataliia NESTEROVA, Liudmila LEBEDEVA, O.SEMENOVA (Russian Federation)*

Wildfires lead to rapid short and long-term environmental transformation that include changes of vegetation cover, soil properties, heat and water fluxes between atmosphere and soil, hydrological regime, erosion and mass movement. The goal of the study was to identify wildfire effects on hydrological regime of watersheds in scarcely-gauged Russian Siberia and Far East in recent years using available hydrometeorological data and hydrological modelling. We used monthly gridded 500 m MODIS Burned Area Product (MCD45) available for the period 2000-2013 to select the basins with fire-affected area rate from 20 to 86 % in Siberia and Far East. Daily river discharges, meteorological data, available data on soil variable states, basic topography, geology and landscape information were collected for each basin. The process-based distributed hydrological model Hydrograph was applied to burned basins to assess the fire influence on hydrological regime and internal flow formation processes. Preliminary results of hydrological and meteorological data analysis suggested that the small basins with high burned area have quick and profound hydrological response to wildfire expressed in increased peak flow. Larger basins with lower burned rates show no significant changes of runoff after the fire. Specific hydrological response to fire in different landscape, climate and topographical conditions across Russian Siberia and Far East will be presented. The results of the Hydrograph model applications to the basins with pronounced fire impact in stationary and dynamic mode will be shown.



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**Features of modern hydromorphological processes in the Lena River delta**

*Denis AIBULATOV, Dmitry MAGRITSKY, A. GORELKIN (Russian Federation)*

The Lena River delta is the biggest river delta in Russia and the fifth on the area in the world. It is the classical, multichannel delta of extension, unique on the ecological and economic importance. The delta is located in high polar latitudes, is washed by waters of the Arctic Laptev Sea and closes huge by the size and difficult on a structure watershed of the Lena River. As a result in the last decades the delta, its mode, a natural complex and estuarial ecosystems experience powerful influence from the changing water runoff of the Lena River and the hydrological mode of the Laptev Sea, regional climatic changes. Hydromorphologic consequence of this influence and hydroclimatic changes became: 1) increase in water runoff (7,2% in comparison with 1935-1976 years) and the warmth (5,7%) coming to the delta; 2) practically lack of changes in a weighed deposits yield; 3) change of their intra annual mode and in particular essential growth of water content of a winter lowwater (for 45%) under influence of both natural, and anthropogenous factors; 4) change of thermal and ice mode of water objects in the delta, in particular reduction of the period with the ice phenomena and freeze-up; 5) absolutely insignificant redistribution of water run-off between the main deltoid channel systems (with a speed <0,2%/10 years); 6) intensification of channel processes and dynamics of sea margin of delta. The collected data, including remote sensing of the earth covering the period from 1920th to 2012 allowed authors qualitatively and quantitatively to estimate these processes, to reveal existential regularities. Besides studying of flooding processes of deltoid flood plain depending on different water run-off values of the Lena River was one of the solved tasks. Researches are executed on a grant of the Russian scientific fund No. 14-37-00038.



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## La vie des banquises côtières de la mer Blanche et la dynamique des rivages

*Fedor ROMANENKO, Tatyana REPKINA, Ludmila EFIMOVA (Russian Federation)*

Les marées, les courants puissants, les bancs pierreux, les îles déterminent la mobilité de la couverture de glace dans la mer Blanche et l'absence des banquises en plus grande partie de l'aire marine. La glace est en movement toujours en coopérant continuellement avec la surface du littoral. En hivers 2000-2015, pendant les expeditions dans les regions différentes des rivages de la mer Blanche on dressait les cartes des banquises côtières et mesurait la quantité des sédiments dans la glace. "Les tentes glaciaires" sont les formes du littoral les plus typiques. Ce sont les entassements isometriques des banquises cassées autour des cailloux est au-dessous d'eux. Ils sont fixés par la glace formée de l'eau refoulée dans les fissures pendant la marée montante. La largeur de la banquise côtière fixe et la quantité des "tentes glaciaires" sont moins au dedans les limites des blocs tectoniques, montantes plus intensivement. La concentration moyenne des sediments aux côtes de tous les types dynamiques augmente de la banquise flottante à la partie supérieure de la banquise immobile (la zone du régime turbulent pendant les tempêtes). La concentration maximale des sediments dans la banquise est 121 g/l, en soubassement - jusqu'a 400 g/l. Elle change fortment en fonction du type genetyque du côté, de la composition des sediments et des autres conditions locals. L'un des agents importants - les conditions meteorologiques de le prise en glace en hiver concret. Le rôle du transport eolien est considérable aux côtés accumulatives sableaux. Les travaux sont soutenu par la RFRF (les projets №№ 14-05-00549, 13-05-00324).



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## Evolution and genesis of permafrost peatlands in southern limit of cryolithozone in Europen North-East

*Alexandr PASTUKHOV, Dmitry KAVERIN, T. MARCHENKO-VAGAPOVA, N. GONCHAROVA (Russian Federation)*

Currently extreme southern limit of the cryolithozone with permafrost temperature 0 ... -1 ° C is the far north taiga in the European North-East. Permafrost is conserved only in peat plateaus, which are an ideal object for assessing climate change impacts in the event of further thawing of permafrost. On the basis of the macrofossil, palynological and 14C data of peat, Holocene evolution and current state of permafrost peatlands were studied. Peat accumulation started about 8000 years ago (BO-2). Then, the accumulation of peat first significantly slowed down, and then almost stopped between 2500-850 years ago. I.e. about 2500 years ago permafrost was aggradated, which manifested itself in the heave of peatland mounds and a sharp decline in peat accumulation due to dry conditions in raised surface peat. There was the formation of permafrost peat plateaus of modern appearance. Fens occurred from SA-3-SA-R (about 850 years ago), when the permafrost partially degraded, the gradual and slower peat accumulation proceeded. Vegetation of peat mounds prevents permafrost thawing in the current climate warming. As mounds surface dry out, lichens succeed mosses and bare peat circles are formed. But dry peat has higher insulating properties and prevents from further thawing. Thawing of permafrost peatlands starting from the surface occurs only as their destruct or on condition of hindered surface runoff with possible formation of lakes and fens. A relatively closed hydrological regime of peat plateaus explains widespread peat mounds with permafrost-affected soils – Cryic Histosols (40% of the area). Thus, permafrost peatlands could be considered as rather stable ecological systems. The study was supported by RFBR 14-05-31111 & UNDP/GEF ClimaEast 00059042.



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**Primary production features in the north-western Bering Sea**

*Kirill KIVVA, Antonina POLIAKOVA (Russian Federation)*

The shelves of the Bering Sea are among of the most productive areas of the global ocean. High rates of primary production (PP) support substantial commercial fisheries and rich subpolar ecosystems in the Bering Sea. The northern Bering Sea is also a pathway for the pacific water entering the Arctic Ocean, so physical and biological processes of transformation of water properties within the region influence the Arctic. Therefore actual data on PP as well as estimations of productivity for the region is of the great interest but rare due to both remoteness of the area and lack of research possibilities. Recent series of oceanographic surveys of relatively high spatial resolution revealed several regional features of the PP field in the region including frontal and upwelling systems. Chemical data on nutrient distribution allowed estimating the spring levels of nutrient and assessing the nutrient drawdown outside of upwelling areas. Local C/ Si/ N/ P molar ratios for particulate organic matter were used to convert the nutrient drawdown to the net community production (NCP) which may be used as a proxy for new PP. For the upwelling areas, rates of vertical movement of the water were assumed to be in the range of 1–4 m day-1. The associated nutrient flux resulted in rates of new PP of 2–10 g C m-2 day-1 depending on the area. The current evaluation suggested the new PP in the coastal domain of the Koryak shelf to be 300–400 g C m-2 year-1, in the western Gulf of Anadyr new PP is estimated to be near 200–300 g C m-2 year-1. Highly productive area in the Chirikov Basin (near 500–800 g C m-2 year-1) is believed to be under influence of strong topographic upwelling. The background rates of the new PP for the northern Bering Sea shelf and central Gulf of Anadyr are assessed to be in range of 80–120 g C m-2 year-1.



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**Cryolithozone Landscapes as an Object of Antropogenic Impacts**

*Nelly TUMEL, Natalya KOROLEVA, Svetlana DEDYUSOVA, Larisa ZOTOVA (Russian Federation)*

The structural and functional organization of northern landscapes is determined by the permafrost temperature and ice content, depth of seasonal thawing, protective vegetation properties. These factors determine the development of the cryogenic processes such as thermokarst, thermal erosion, solifluction, frost heave and others. The landscape sustainability is the ability of landscapes to to resist the technological activation of those processes. Main permafrost characteristics needed in the human impacts study are considered under the "environmental perspective". Their zonal and regional changes often affect the ecological situation in different directions. The landscape permafrost ecological state evaluation takes into account the lithocryogenic stability and bioresource value. This allows to determine areas of varying degrees of risk for engineering objects and biota preservation. The development of different ecological situations based on the consideration of two major factors: the degree of mechanical damage of the topsoil cover as a result of the impact of engineering structures as well as overexploitation during deer pasturing, and the potential landscape resistance to these types of damage. Each situation is characterized by a specific set of cryogenic processes with different intensity. During the environmental assessment the following data are used: the area affected by the processes, the rate of process development and attenuation, the degree of natural landscapes disturbances, the threat to the functioning of engineering structures. To stabilize disturbed landscapes various strategies of environmental management are proposed, including engineering and bio recultivation, snow redistribution, heat and water reclamation, resource protection and others.



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**Comprehensive geomorphologic studies of the Antarctic**

*S. BOLTRAMOVICH, A. LASTOCHKIN, M. KALYGIN, Andrey ZHIROV (Russian Federation)*

Geomorphologic Atlas of the Antarctic (Russian issue - 2011; international issue - 2013) can be estimated as a unique issue dedicated to the relief of a single continent. It has been created by the team of researchers from St. Petersburg and granted by the Russian government. The Atlas presents an integrated model of day-surface, subglacial and subaquatic relief of the Antarctic. The Atlas is based on the new morphological approach worked up by Prof. Alexander Lastochkin from SPbSU. This approach embraces Earth surface division into defined elements – 20 points, 25 linear and 52 areal – and their networks that serve as functioning geo-systems of different levels. Data are mined from various Russian and international sources, including BEDMAP: geophysical, geographic, geologic, etc. Application of new morphological approach has made it possible to detail the Antarctic subglacial-submarine surface and to get new information concerning dynamics of different structural stages of the ice sheet. The mapping of Antarctica is carried out both for the entire continent and its separate, well studied regions: Vostok Lake and Lambert Graben. A set of maps comprises analytical (elements), orographic (landforms) and other geomorphologic models as well as morphometric and morphotectonic maps that allow assessing neotectonic and glacioisostatic movements. The glaciodynamic studies have revealed the strong correlation between ice movements and day-surface and subglacial relief. Relief-forming processes of the present and pre-glacial epoch as well as the detailed studies of some bedrock coastal areas are also represented in the Atlas.



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## Geographical Information System for Sustainable Arctic Technology

*Nataliya MARCHENKO (Norway)*

ABSTRACT The essential part of innovations and installations is created and lives in natural conditions. Understanding and knowledge about the environment is the main issue for sustainable development in harsh regions such as the Arctic. The modern technique to represent environmental data is Geographical Information System (GIS), which has become very important for industry and management, particularly within contemporary technology projects. The special GIS is developed at the University Centre in Svalbard (78o North) in the frame of Sustainable Arctic Marine and Coastal Technology (SAMCoT) project associating several industrial and educational partners. It shows important for arctic technology issues pertaining to fixed and floating structures, topography of coastal zone and erosion, sea currents, sea ice properties, installed equipment and obtained data. The exposition of physical-geographical conditions, natural resources deposits and current exploration activities creates the background for future inventions. There are 5 hierarchical levels of mapping and presenting materials: from an overview of the whole European Arctic to detailed plots of key sites with high resolution 3D models based on Laser Scanner point clouds. The main locations for project activities presented as key sites are in central Svalbard in Van Mijenfjord (closed by island gulf with long lasting sea ice, coal mine and port activities), Advent Fjord (main settlements and port activities), and Tempelfjord (glacier outlets); and in North-West Russia at Baydara Bay, and Varandey. There are also places of research vessels survey in Barents Sea and Fram Strait. Data comes from published materials (available to the public) and field work measurements performed by project participants (available internally). The GIS gives the possibility to run mathematical models on real maps, taking natural conditions and processes into consideration. On-line version will make the results accessible for the colleagues from different places.



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**Social GIS Russian Arctic – multiscale analysis and modeling of processes in society**

*Andrey MEDVEDEV (Russian Federation)*

Modern automated geographic information systems provide an opportunity to monitor social and economic information and help come up with the most effective measures of social assistance and support to the population. Based on these principles the "Social GIS Russian Arctic" was established. In addition to the complex socio-demographic characteristics it provides the opportunity to assess the social situation in terms of the effectiveness of social policy measures. It also allows the analysis and modeling of processes and phenomena in society at the regional level, provides the collection and systematization of statistical data of different hierarchical levels, helps to identify most important indicators of the social situation and calculate integral indices. This GIS is a comprehensive product that characterizes the social situation in the Russian Arctic in comparison with other regions and covers a long time period of observation. In this regard it was important to have comparable data coverage at various hierarchical levels and temporal coherence of similar content maps. An important element of this GIS is the presence of a unit contains in addition to the analytical maps, comprehensive and synthetic maps to provide an integrated presentation of information. GIS is based on materials of various types, above all, map data, as well as statistical data (materials of state statistics and departmental reports, data from sample surveys of the population).



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## Socio-economic and environmental procrastinators and facilitators of sustainable development in the Arctic single-industry cities

*Yuliya ZAIKA, Elena GOLUBEVA (Russian Federation)*

Along with its doubtless resource role, Arctic is the polar region with a permanent human population which refers us to the sustainable development of local settlements and communities. The most part of Arctic settlements and cities depends on exploitation and extraction of natural resources. It is known that Northern single-industry communities has low diversification of economy and thus are vulnerable to any factors influencing their development. We aim to investigate socioeconomic and environmental factors which contribute to facilitation or procrastination of sustainable development of these cities, such factors as structural changes in economy and enterprises after collapse of Soviet Union, downsizing and depopulation, domestic and foreign market conditions, pollution, the quality of life of local population, possible changes of resource potential, and other key factors. Based on factor analysis and community consultations (surveys, questionnaires and interviews) the concept of single-industry cities development will be discussed. It includes different development scenarios which will help to indicate the main types of the cities with the progressive and depressive scenarios of development. We aim to answer the following research questions: Will the depressive scenarios always end with abandoned localities (based on previous examples and case studies)? What is the point of no return in the transition period from progressive to depressive scenario? What is the best facilitator of sustainable development of single-industry cities in the Russian Arctic (based on all-Russian and international case-studies)?



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**Formation Of Pine Woods On The Tersky Coast Of The White Sea At Phytoland Improvement**

*Elena GLUKHOVA, Elena GOLUBEVA (Russian Federation)*

One of the actual problems of modern geoecology is the conservation and sustainable use of land resources of sea coasts, including the development of methods of recovery as a result of degradation. Land degradation is not only arid, but humid regions. An example of such an area with degradation processes occurring on the coasts can serve as the White Sea coast. On the coast of the White Sea (the southern part of the Kola Peninsula), in areas confined usually to human settlements in estuaries, on light sandy soils, formed by ancient river fans, there is a process of active destruction of soil and vegetation. On the Tersky coast of the White Sea to secure the sand masses since 1985 held phytomeliorative work. The aim of our research - the study of the structure and dynamics of emerging pine forests at phytomelioration on the sands of the Tersky coast of the White Sea as performance reclamation. Because of the aim, following problems have been solved: 1. The features of climate, topography and the nature of the content of mineral nutrients in the soil uneven-aged plantations of Pinus sylvestris L. 2. The structure and floristic diversity of different ages formed communities of pine Pinus sylvestris L. 3. The most informative performance indicators phytomelioration and the recovery stage of pine forests. The results of studies of the structure and dynamics of emerging pine forests on the sands of the Tersky coast of the White Sea suggests three stages of pine forests, differing phytocenotic and floristic parameters and reflect their sustainability. Implementation in practice phytomelioration obtained results allows to increase the effectiveness of rehabilitation of degraded lands, not only on the Tersky coast of the White Sea, and in the regions with similar natural conditions.



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## Arctic Shipping Challenges and Safety Issues

*Nataliya MARCHENKO (Norway)*

Growing transport activities in the Arctic, accelerated by reducing of sea ice in the Arctic and shortage of resources in the South, increases possibility of unwanted incidents. The vulnerability related to human safety, environment, and physical installations/vessels demands strengthening of preparedness and cross-boundary and cross-institutional collaboration. Arctic shipping is a big challenge due to heavy ice conditions not only in winter. The main operational risk factors are geographical remoteness, climate-change related aspects and weather, electronic communications challenges, sea ice, insufficiently good maps (hydrographic and meteorological data). The main risks to the environment are pollution and ecosystem disturbance. The assessment of risk level and mitigation means gives the base for elaboration of improvements of preparedness system. Activity and probability of incidents, as current and estimated for future development differs in different part of Arctic. Consequences of incidents depend on the type of events, scale and geographical location. We consider Eurasian Arctic. The ice massifs and ice jets are the most dangerous phenomenon along the Northern Sea Route. Icing, storms and icebergs in the north are the main complications in the Barents Sea. The large tourist activity in specific for Spitsbergen area. There is no other place in the world where cruise liners with almost 4000 tourists on board run up to 80oN. The accidents in the Arctic Seas have been classified, described and connected with weather and ice conditions. Behavior of the crew is taken into consideration. The main reasons for shipwrecks and damages are collisions with of ice floes, ice compression and drift, grounding. To learn from previous experience is important for the safety of shipping.



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**Snow Water Equivalent from Landmasses.**
**The assessment of the relation for the European Russia.**

*Vadim GRIGORIEV (Russian Federation)*

The relationship between snow water equivalent (SWE), derived from an observation data, and terrestrial water storage (TWS), taken from GRACE (Gravity Recovery and Climate Experiment), is analyzed at monthly time scale. In doing this, we interpolated GRACE grid observations to locations on snow-measuring routes. Also we estimated monthly SWE for some European Russia catchments by water-balance-based method (as the difference between TWS and river runoff) and compared them with observed in situ SWE. Areas with different values of the correlation coefficient between SWE and TWS were located. The agreement between SWE and TWS was particularly good for catchments with a small amount of lakes or water reservoirs, small TWS variability in the warm season, and no long thaws in the cold season. Thus, the correlation coefficient for the northeastern European Russia is about 0.7-0.9 with data series including around 40 samples. By contrast, the correlation coefficient for the Lower Volga is insignificant. The estimates of river flow for the catchments show only a weak dependence on the choice of GRACE datasets.



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## Thermokarst processes formation along linear objects (an example of long distance oil pipeline in Siberia)

*Elizaveta MAKARYCHEVA (Russian Federation)*

Thermokarst phenomenon along the oil pipeline of 2500 km length in the South of the Eastern Siberia and the far East was analyzed. The width of the survey area is one kilometer, therefore the phenomenon has been investigated not only in the pipeline affected zone but also under natural conditions. Initial data for the research represented by spatially determined (coordinate linked) images from helicopter visual survey. We got more than 7000 images during the aerovisual observations for 2010-2012. Invariability of construction technology along the investigated object allowed to estimate the degree of the technogenic impact of pipeline on the factors and condition of termokarst possesses development. Three-year survey allowed to collect data about the dynamics of the process and to identify trends. As a rule it is difficult to separate thermokarst natural flooding or bog formation. Due to the high diversity of natural conditions along the pipeline lot of different morphological species of this process was discovered. The study area location near the Southern border of the permafrost zone also affects on the specificity of phenomenon process. Coverage of thermokarst processes in landscapes of southern permafrost zone in modern scientific literature is weak and require further analysis and systematization. Thermokarst phenomenon typification near the southern border of the permafrost zone was elaborated on the base of the results of the following analysis. The obtained data allowed us to estimate the influence of environmental conditions on the dynamics and distribution of thermokarst processes and make the zoning on the leading factors and conditions. Due to the high variety of morphological characteristics of the process it was suggested that different mechanisms of their formation, time of occurrence and stage of development occur. The problem of methodology for assessing the impact of different types of thermokarst processes for engineering objects was solved. Distribution graphs for thermokarst phenomena along the pipeline route in the zone of pipeline influence and in natural conditions were built/drawn-up. The distribution regularity analysis of thermokarst allowed divide all phenomena into two classes by their confinedness to relief elements. Landscape, climatic , tectonic and permafrost conditions were also analyzed. Natural and man-induced regularities of thermokarst processes were identified. Different mechanisms of thermokarst formation, time of occurrence and stage of development were established. Identifying of thermokarst processes is necessary for more accurate assessment of their hazard as well as for forecast of its development.



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**The role of soils composition, structure and properties in formation of temperature regime andactive layer thickness on west coast of Baydara bay**

*Daria ALEKSYUTINA, Rimma MOTENKO (Russian Federation)*

Arctic nearshore area is a very dynamic environment. Multicenter studies were conducted on the west coast of Baydara bay Kara Sea, as a part of major international project SAMCoT. The objectives of presented stage of the work were to identify the trends of thermal properties and water phase composition in frozen samples, depending from temperature, moisture content, density, soil salinity and peaty soil and to understand the role of these characteristics in the formation of soil temperature and thickness of active layer. For several field seasons the investigations were carried out, including permafrost study, survey, drilling and laboratory tests. Experimental studies were focused on physical, mechanical, thermal and other soil properties researched in samples and in situ. Five boreholes with the depth from 2 to 6.5 meters were drilled on the surface of I-st marine terrace. Conducted temperature measurements showed the average annual temperature of soils -4.3°C at the bottom of the holes. Core samples were collected with natural composition and structure for further laboratory analysis. First marine terrace is composed of interbedding sediments, such as silty clay, silt and silty sand, having different properties and composition. Based on obtained changing trends in soil composition and properties the active layer thickness and temperature regime were estimated using the software program "QFrost", developed by geocryological department MSU (http://www.qfrost.net). The results showed a good convergence with the field data.



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## The role of variability of climatic conditions and snow cover's thickness in the change of freezing depth of the underlying ground

*Denis FROLOV (Russian Federation)*

In published in 1954 monograph of V.A. Kudriavcev was considered the impact of variability of climatic conditions and snow cover's thickness on the dynamics of permafrost. For the approximate calculations of variations of ground freezing depth V.A. Kudriavcev suggested the equation, which includes snow cover thickness, snow thermal properties (heat conductivity) and the amplitude of annual air temperature variation. For our research we considered obtained data on climatic conditions (temperature) of winter seasons (November-March), as well as seasonal values of snow cover thickness and ground freezing depth for 1966/67–2007/08 on meteorological stations of Irkutsk, Barnaul and Turukhansk. As a result of conducted analysis was revealed that averaged temperature of winter seasons on meteorological stations of Irkutsk, Barnaul, Turukhansk from the period of 1966/67-1986/87 to 1987/88-2007/08 increased from -13.9, -12.3 and -22.3 to -11.9, -10.7 and -21.0°C correspondingly. Snow cover thickness increased from 28.6, 38.6 and 71.9 to 29.2, 47.0 and 95.3 cm, and ground freezing depth decreased from 172, 165 and 133 to 115, 72 and 118 cm correspondingly. Analyses of extremal values of temperature, snow cover thickness and depth of freezing on pointed meteorological stations in both considered time periods revealed that seasonal temperature minimum, minimum of snow cover thickness and maximum of ground freezing depth is reached in Turukhansk and Irkutsk in 1969 and 2001 and in Barnaul only in 1969. Seasonal temperature maximum, snow cover thickness maximum and minimum of ground freezing depth is reached in Turukhansk in 1989 and 2008 and in Irkutsk in 1978. Variations of winter season temperature and snow cover thickness are the reason of ground freezing depth variations. Analysis of mean values of variations of winter season temperature and snow cover depth in considered time periods revealed, that decrease of mean variation of temperature in 1987/88-2007/08 in Barnaul and Turukhansk in compare with 1966/67-1986/87 leads to decrease of mean variation of freezing depth. The increase of mean temperature variation in Irkutsk in considered periods lead to decrease of mean variation of freezing depth. Analysis of maximal values of winter season temperature variations, snow cover thickness and depth of ground freezing revealed that for prevention of damage by seasonal freezing of pipelines in the ground it is necessary during the construction for the comparable with considered time period to embed the pipelines to the depth of not less that sum of mean depth of freezing and maximal variation of depth of freezing.



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**Sea level fluctuations in the small inlet of the White Sea according to observations in 2008 – 2014**

*Alexey KONDRIN (Russian Federation)*

Sea level oscillations in the small inlet of the White Sea are investigated using the data of observations in summer – autumn months of 2008 – 2014. The measurements of sea level, air pressure, wind speed and direction, water and air temperature were performed at the White Sea Biological Station of Lomonosov Moscow State University. The features of tidal sea level oscillations in this area are described. Focus is given to the study of the residual sea level (RSL) oscillations in the synoptic timescale. The RSL fluctuations were obtained by excluding tidal component from the measurement data and then applying Butterworth filter. A number of significant RSL rises (more than 1, 45 m) and their relation to the synoptic conditions is considered. In most cases significant wind-surge fluctuations occurred in autumn owing to the amplification of cyclonic activity over the waters of the White and Barents Seas. Maximum wind surges occurred during the passage of deep cyclones whose trajectories were east of the White Sea at the time of the highest level rise. These cyclones, along with a decrease in atmospheric pressure, create surge northern winds. The statistical properties of the fluctuations of the residual sea level, and interannual variations of hydrometeorological characteristics during the observation period are considered. The tendency of increase in air and water temperature as well as residual sea level is revealed. Key words: tides, residual sea level, White Sea, wind surges, synoptic conditions, interannual tendency.



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**Sedimentology of thermokarstic lakes: Terekhol Lake, Southern Siberia**

*Yulia FUZEINA (Russian Federation)*

Terekhol is an open shallow thermokarstic lake located in the southwestern part of the Terekhol Basin - a small pull-apart basin the south-western closure of the Baikal Rift Zone (SE of Tyva Republic). The lowest part of the lake bottom is located along the foot of the NW side of depression. The average lake depth is 0.4 m (max - 1.2 m).The majority of tributaries flow into the lake from the south and southeast. The lake was formed due to damming of the SW corner of the basin bottom by alluvial fans accumulated in the central and eastern parts of the basin. The lake is abound with palsas that make numerous islands mostly along the southeast coast. According to their heights two groups of islands may be recognized: high (higher than 2 m above the lake) and low (lower than 2 m). Surface topography of islands is usually a combination of ridges and hollows, presumably of permafrost origin. Highest islands are located mostly far from the coast, while low islands are close to the lake banks. Lake bottom sediments and deposits of islands were studied in cores and pits. Radiocarbon dating established their Holocene – very end of Late Pleistocene age. Lithological and mineralogical studies were carried out for lacustrine sediments in a number of cores and for sandy sediments of eight islands. Grain size and mineralogical analysis allowed to distinguish two types of sands with different degree of weathering of unstable minerals, which may indicate their different age. Correspondence of mineral composition of sand from lacustrine sediments and sand from alluvia of tributary streams is not clear. This is probably due to mixing as a result of cryogenic processes in a shallow lake. Cryogenic disturbance is the main cause of diversity of lake sediments in the Terekhol depression.



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**Analyzing winter activities of wild Taimyr reindeer using Argos satellite collars**

*Emily T. FRANCIS, Andrey N. PETROV, Leonid A. KOLPASHCHIKOV, and Michael MADSEN (Russian Federation)*

The Taimyr Reindeer Herd is the largest wild reindeer population in the world, and is located in the very north central region of Siberian Russia. Previous research has been conducted using aerial surveys during the three seasons for reindeer: calving, summer and winter. Winter is the most difficult season to conduct research and has the least amount of data. However, recent use of Argos satellite collars have produced almost 11 months of tracking data at 15 minute intervals for 12 reindeer within the herd. This dataset will be used with GIS and remote sensing to analyze winter activities; focusing on seasonal behavior, migration distance and speed throughout fall, winter and early spring. Digital Elevation Models (DEMs), satellite imagery and weather data will be utilized to understand site selection for reindeer feeding and resting. The study will provide deeper understanding of wild reindeer activities and survival during the harsh Siberian winter.



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## Characteristics of active-layer deposits of Schirmacher Oasis, Eastern Antarctica

*Veronica ALEKSEEVA, Tatiana ALEKSEEVA, Dmitriy FEDOROV-DAVYDOV, Andrey ALEKSEEV*
*(Russian Federation)*

The study of mineralogy and chemical composition (bulk samples, 0.05-0.1 mm and < 0.05 mm fractions) of 3 profiles of active-layer deposits in the eastern part of the Schirmacher Oasis in Queen Maud Land in East Antarctica has been done using XRD and XRF with the aim to investigate the impact of Antarctic type of climate on weathering. SEM analysis of quartz grains separated from 0.1-0.25 mm and 0.25-0.5 mm fractions was done to characterize the surface textural features and to understand the processes of pedogenesis. Active-layer deposits (up to 20 cm depth) are developed from different types of gneiss. The material represents by small- and medium-grained sand with significant (up to 28%) amount of gravel. The mineralogical composition inherits from parent rock material and is dominated by quartz, feldspar, amphibole, mica and vermiculite. As a rule the content of fine fractions and vermiculite decrease towards the surface probably due to the active wind deflation. The chemical composition and geochemical weathering indices of studied profiles show the redistribution of separate elements and signs of chemical weathering. Quartz grains morphology shows the strong connection with the deposits substance and mostly represents the weathering material of the parent rocks. Quartz grains have no signs of distant water or aeolian transport. Up to 70% of quartz grains from the upper 6-8 cm show active chemical weathering including silica precipitation and dissolution, probably, as a result of organic acids influence from surface mosses and algae. Lower frozen layers with presence of icy partings demonstrate the increase of particle angularity, high relief, conchoidal fractures, “fresh” superimposed plates which are connected with the intensification of a frosty weathering.



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## Development of environmental monitoring systems, integrated assessment and forecast of environmental quality in the Yamal-Nenets Autonomous Okrug

*Dmitry MARINSKIKH, E.S. KAZANTSEV, A.V. KIRILLOV, V.N. KOSTYCHEVA, A.N. KUZMENKO, O.A. PRITUZHALOVA, O.V. SMIRNOVA, A.M. SHUMOV et al. (Russian Federation)*

In the conditions of intensive oil and gas development of the Yamal-Nenets Autonomous Okrug (YNAO) of particular relevance to government acquires effective environmental planning, based on an objective assessment and forecast changes in environmental conditions. Department of Natural Resources Regulation, forest relations and development of oil and gas industry YNAO since 2010 systematic work on creating and development of a common territorial environmental monitoring system (CTEMS). In the period 2010-2015, with the participation of JSC "Sibzemproekt" (Bratsk) and JSC "SPC" SibGeo "(Tyumen) following results were achieved: - Formed legal framework for integrated observations of the state of the environment within the boundaries of the license areas (Government YNAO on 14.02.2013 56p); - Created a regional network of environmental monitoring, which includes 15 complex polygons observations; - Developed an automated information system (AIS) "Environmental monitoring YNAO", provides for the exchange and analysis of observations, including those derived from mining companies-subsoil users; - Developed and implemented a unique model of integrated assessments of the environmental status of the territories and the forecast of its change in the short, medium and long term, a directory of regional average pollutant concentrations. In the poster describes the functional and analytical capabilities of AIS, the methods used automated assessment and prediction of environmental quality, information exchange schemes in the framework of the CTEMS, as well as the prospects of its development, to ensure early detection and prevention of environmental threats. Also presents the conceptual basis for the creation of international scientific station on Island Bely (White).



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## Urban Development in the Arctic

*Vycheslav LYAKHOV (Russian Federation)*

Urban Development in the Arctic. Urban development in northern territories has its particularities due to this territory's climatical conditions, speci_x001F_cs of local economy, lower population density. Thats why it could be interesting to learn more about urban planning in these territories, and to compare speci_x001F_cs of built environment in two neighbour countries - Norway and Russia - di_x001E_erent countries with di_x001E_erent histories, but still having quite much in common. Three cities were taken as examples: Kirkenes form Norwegian side and Nikel and Zapolyarnyj from the Russian. These places have quite much in common - really close location, industrial mining economics, almost the same size, population and climate.



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## Decentralized power supply based on local and renewable energy sources: a case of Russian Arctic

*Maria MORGUNOVA (Russian Federation), Dmitry SOLOVJOV (Russian Federation)*

In a reality of growing interest towards Arctic socio-economic growth and natural resources development, the study aims to explore opportunities to improve energy supply in the Russian Arctic. The focus is on effective and environmentally friendly decentralized energy supply of small settlements and specially protected natural territories of the Russian Arctic based on local energy sources, including renewable energy. A wider use of decentralized energy systems can provide more industrial opportunities and serve as a basis for an integrated approach towards exploration and use of Arctic region energy potential. This includes natural resources exploration and exploitation, transport and energy infrastructure development, and overall industrial progress. Use of local and renewable energy sources gives an opportunity to threat Arctic region development in a more sustainable manner. The study provides analysis of energy provision of small settlements and specially protected natural territories, structure of energy consumption and load curves of potential energy consumers. Methods to improve energy usage are based on combination of traditional sources as fossil fuels and renewables. These include evaluation of potential wind and solar energy sources in Russian Arctic, and comparative analysis of energy accumulation systems based on climate parameters. Complex analytical method based on quantitative and statistical data on Arctic renewable energy potential with integrated principles of ecological safety and energy efficiency gives an insight into an optimal energy system structural change in the Russian Arctic. The reported study was funded by RFBR according to the research project No. 15-08-06048 a



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# C12.07 Cultural Approach in Geography

## Global Sustainability and Global Understanding

**Chairperson(s):** *Beno WERLEN*

- Land surface pattern study under the framework of Future Earth

  *Shaohong WU, Yan ZHAO, Qiuhong TANG, Jinyun ZHENG, Jiangbo GAO, Tao LIANG, Quansheng GE (China (Beijing))*

- Glocal Environmental Education – A Key to Global Sustainability

  *Yukio HIMIYAMA (Japan)*

- The hyperreal of urban space: youth on the fly create sustainable cultures

  *Margaret ROBERTSON (Australia)*

## Performing places, cultures and nature in different social and geographic settings 1

**Chairperson(s):** *Louis DUPONT*

- Performing space and places: theoretical foundations for a renewed approach in geographic researches

  *Louis DUPONT, Rachele BORGHI (France)*

- Performing in a national and international congress: English or not English?

  *Nathalie LEMARCHAND, Antoine Le BLANC (France)*

- La mobilité à pied des adolescents : pratiques et performances dans l'espace public

  *Florence HUGUENIN-RICHARD (France)*

## Performing places, cultures and nature in different social and geographic settings 2

**Chairperson(s):** *Louis DUPONT*

- Relocation of Kurmanj Kurds leading to different cultural geography in the North-East of Iran

  *Tiam Mohammadzade MIRAKI, Nooshin HOSSEINI (Iran)*

- La performance du funkeiro comme forme de résistance aux normes hégémoniques sur les plages de Rio de Janeiro

  *Claire BRISSON (France)*

- Femme des villes, homme des champs. Performer le genre et l'espace

  *Marianne BLIDON (France)*



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## POSTER EXHIBITION

- The model of the Geosocial process reflecting the relation between the natural and social disasters

  *Marina VIKULINA, A.A. DOLGAYA, A.V. VIKULIN, A.S. TURCHANINOVA (Russian Federation)*



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IGU 2015 – 0870

## Land surface pattern study under the framework of Future Earth

*Shaohong WU, Yan ZHAO, Qiuhong TANG, Jinyun ZHENG, Jiangbo GAO, Tao LIANG, Quansheng GE (China (Beijing))*

Future Earth is a global platform for international scientific collaboration, which enables integrated research on grand challenges and transformations to sustainability, strengthens global partnerships between researchers, funders, and users of research, and communicates science to society and society to science. It combines IGBP, IHDP, WCRP, and DIVERSITAS. Its objectives are: to provide the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability. It aims at scientific integration and co-production of knowledge. Analysis on characteristics of land surface pattern and its research progress shows that land surface is one of the main areas that Future Earth focuses on. Land surface pattern, formed by interaction of physical factors and different processes, may be taken as a fundamental regional frame for study of Future Earth. The prospective research of land surface pattern should make effort to improve the methodology to support progress of integrated research in physical geography.



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IGU 2015 – 4556

## Glocal Environmental Education – A Key to Global Sustainability

*Yukio HIMIYAMA (Japan)*

IYGU will play an important role for global sustainability. It is principally a grand educational and learning campaign which is intended to support Future Earth by strengthening its educational, humanistic, cultural and philosophical aspects. Elaboration and promotion of 'glocal' environmental education, which emphasizes multi-scale views in dealing with global and local problems or activities, can be a core element of IYGU, and may ultimately be a key to global sustainability.



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IGU 2015 – 2833

**The hyperreal of urban space: youth on the fly create sustainable cultures**

*Margaret ROBERTSON (Australia)*

It's 'normal' to be bored, detached, and in search of personal space. Nimble, quick and adaptable, young people operate in ever-changing social and urban space. There are few borders. They live with hyper-diverse environments and dynamic space. Their capabilities as young citizens demonstrate different kinds of leadership presenting adults with a conundrum. As consumers, learners, and digital experts, their imaginaries create new values and futures under construction. Knowing how the millennial generation is influencing their ecology is critical for aligning policy responses to urban design, health, education and employment opportunities. The voices of young people are an integral part of this process and our research with adolescents appears to be suggesting pathway approaches that are ecologically sustainable and a quick fix for progress. Perhaps the urban village can be found in our megacities. But is it a pop-up venture? Can it be maintained?



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IGU 2015 – 2284

## Performing space and places: theoretical foundations for a renewed approach in geographic researches

*Louis DUPONT, Rachele BORGHI (France)*

The goal of our presentation is to discuss the theoretical foundations of the concept of performance in geography that is in connections to human beings' relation to space in situation of co-presence (and diversity). The focus is primarily on modern urban space and places. Seeing those through the lens of performance allows geographers to raise or reactivate questions on the interplay of space, culture and the social, thus opening up geography to new practical end empirical researches. Indeed, as suggested by Nigel Thrift, performances and performing mean a embodied person constantly producing reality, that is the reality of a place. It can be by simply "being there", but more often by "doing something", sitting, walking, talking, showing signs, etc. His/her actions create place in enlightening the socio-cultural and political norms that become manifest through those actions and interactions, performed intentionally or not, from day to day performances in situation of co-presence, such as a classroom or an international geography meeting session, to actions interconnected to activities taking place at the regional, national and global scales. In other words, places tend to be prescriptive, at various degrees, embodied persons tend to be performative. As a consequence, one can thus find his/herself "in place" or "out of place", as Tim Creswell has shown, because of physical, cultural, social, sexual attributes, given or assumed.



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IGU 2015 – 1507

**Performing in a national and international congress: English or not English?**

*Nathalie LEMARCHAND, Antoine Le BLANC (France)*

In this global area, it has becomed almost common sense in scientific circles to say that the only way to be listen to at a conference, such as UGI, is to send an abstract in English to do a presentation in English: our Education Ministry, our University, our Laboratory, our colleagues, say so. That is the case in France, but also in many countries and in some case, it goes as if there is no questionings: English is more than a language, it is a sociocultural and political norms in international congress. However, this norm is more than a tool of communication; it leads a norm of the scientific production, ad a thought-processing norm. For the non-English speakers, presenting in English, abiding to the norms of presentation, is as such a perfomance: in the way articles are written, in the form of presentation, in the state of art, in the choice of concepts and approaches. For, concepts and approaches are not only a way of saying, they expressed a way of taking about the World, about reality. Are we thus stuck in a scientific foucaldian division of labor: some, English speaker write the text, others repeat or imitate, with various quality of performances. I am not saying that there is one good way or one good language, but as a geographer I am puzzled in front of this global thinking process. Is there something lost in the production of scientific work in the social sciences within a single global language? Within a single way of framing scientific work? Is the normalizing process of "scientific English" in the social sciences affect the necessary diversity of scientific production? Does global science disqualify studies and researches produce in a non-normative language as mere "local" case studies. I don't know if I can answer those questions, but my goal here it at least to raise them?



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IGU 2015 – 4076

## La mobilité à pied des adolescents: pratiques et performances dans l'espace public

*Florence HUGUENIN-RICHARD (France)*

Les caractéristiques fines de la mobilité des adolescents piétons sont peu connues en France. La sécurité des piétons âgés de dix à quinze ans a été moins étudiée dans la littérature scientifique que celle des plus jeunes piétons, pourtant cette tranche d'âge constitue aujourd'hui la population avec le plus fort taux de victimes piétonnes dans les statistiques d'accidents de la circulation. L'hypothèse est faite que l'insécurité des piétons adolescents tient en partie à des singularités de leurs pratiques de mobilité à pied (plus indépendantes) et de de leurs usages de l'espace urbain pour des jeux, occuper du temps libre, se promener, se retrouver entre pairs, «performer». Au-delà du fait de se déplacer, la mobilité devient à l'adolescence une pratique socialisante. Dans ce contexte, des auteurs comme (Grafmeyer et Authier, 2008) ont montré l'importance du rôle de l'espace : la mobilité devient à cet âge-là une pratique structurante, en forgeant les rapports des adolescents à leur territoire de vie et en constituant leurs premières « expériences urbaines autonomes » (Kokoreff, 1994). A partir d'un travail d'enquête sur le territoire de la métropole de Lille (France) auprès d'enfants ayant de 10 à 15 ans, nous proposons dans cette communication une analyse des pratiques fines de leurs pratiques spatiales à pied pour se rendre au collège et de leur perception de l'environnement urbain. L'originalité des travaux présentés vient de la méthodologie mise en place : dans un premier temps, nous présenterons les résultats de l'analyse de données issues d'un questionnaire quantitatif sur les pratiques générales de mobilité. Nous affinerons ces connaissances par une analyse sous système d'information géographique des résultats d'une enquête qualitative au cours de laquelle nous avons fait cartographier et commenter à un panel d'adolescents leurs pratiques (les rues qu'ils empruntent, les lieux qu'ils fréquentent), et leurs perceptions de l'environnement urbain dans lequel ils évoluent autour de leur collège (les rues ou lieux qu'ils trouvent sûres ou dangereux, agréables ou désagréables, faciles ou difficiles).



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IGU 2015 – 0153

**Relocation of Kurmanj Kurds leading to different cultural geography in the North-East of Iran**

*Tiam Mohammadzade MIRAKI, Nooshin HOSSEINI (Iran)*

These days, one of the crucial subjects in the cultural geography and anthropology is to study about formed cultural relations of ethnics in different places. Appeared spatial forms resulted from these relations demonstrate the stable interaction between humans and geographical environments which have been evolved and sustained within historical processes and time frames. Kurd ethnics settled in the North-East of Iran – Province of North Khorasan – have formed a different and special space in the cultural geography of the region, which has led to a special distinction of this region from other parts of the North-East Iran. As a result, a new cultural map has been appeared in this region. Kurd ethnics of this region are part of Kurmanj Kurds of North-Western Iran, whom were forcibly relocated in the era of Shāh 'Abbās the Great -the 5th Safavid Shah Emperor of Iran- to the North-East of Iran. The objective of this paper would be studying the anthropological and cultural relations of Kurmanj Kurds settled in North Khorasan of Iran. In this research, music of Kurmanj Kurds of North Khorasan and their traditions, customs and ceremonies would be considered as the main component in studying the cultural relations. This research would answer that how Kurmanj Kurds have been adjusted with their geographical environment and how they have formed human-environmental relations in the region with different cultural geography. Keywords: Ethnics, Kurmanj Kurds, Cultural Geography, Environmental effects on traditions



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## La performance du funkeiro comme forme de résistance aux normes hégémoniques sur les plages de Rio de Janeiro

*Claire BRISSON (France)*

Les plages de Copacabana et d'Ipanema à Rio, en tant qu'objets de discours sont performatives. Les discours qu'elles cristallisent, parce qu'ils mettent en adéquation une portion d'espace et un discours identitaire sur cette même portion, sont territorialisant. Ils participent d'un marquage du corps par le pouvoir : le corps est impliqué dans les mêmes dynamiques de pouvoir que celles qui définissent la normativité de l'espace en séparant les corps in place de ceux qui ne possèdent pas les caractéristiques physiques, sexuelles requises, out of place. Les plages sont prescriptives: les corps incarnent et performent ces prescriptions. Cependant, la performance n'incarne pas seulement les normes socioculturelles qui la régissent; elle participe elle-même à la reproduction et à la subversion de ces normes. Cette communication propose d'étudier les arts de faire et de pratiquer l'espace des funkeiros (qui écoutent du funk), dont la présence sur le sable est souvent jugée illégitime. Le corps même de ces funkeiros opère un premier glissement par rapport au corps normé par les discours. L'analyse du « paysage sonore », ensuite, révèle une saturation de chocs, de lignes de basses qui se superposent, s'affrontent, chacune tentant d'imposer son territoire. Il s'agit bien de territoires appelés symboliquement par la musique, cristallisés à l'échelle locale : des territoires ethniques qui se retrouvent convoqués par la puissance d'évocation de la musique. Par le funk, emporter de la terre avec soi : une terre afro-américaine revisitée par des noirs qui reprennent à leur compte un reproche traditionnel. Funk used to be a bad word : voilà un paysage sonore résistant au coeur de la zona sul de Rio de Janeiro, qui interroge les masculinité et féminité hégémoniques.



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## Femme des villes, homme des champs. Performer le genre et l'espace

*Marianne BLIDON (France)*

Depuis 2001, une émission de téléréalité – L'amour est dans le pré – reçoit en France un succès d'audience qui ne se dément pas. Partant du présupposé d'un fort célibat des agriculteurs du fait des contraintes démographiques (différentiel homme/femme, exode des jeunes femmes vers les villes), économiques (rudesse des conditions de travail, durée du temps de travail) et géographiques (isolement, faible densité), ce programme hebdomadaire se propose de mettre en relation des femmes principalement citadines avec des hommes agriculteurs afin de favoriser leur mise en couple. Il s'agit d'amener à la campagne des citadines, souvent issues de milieux populaires et résidant dans les banlieues des grandes villes, à la campagne dans un espace marqué par un fort exode rural où les possibilités de rencontre sont limitées. Généralement voué à l'échec, ce dispositif, emprunt d'une logique libérale de marché, met à jour une économie matrimoniale marquée par l'exotisme social et spatial où l'altérité géographique est naturalisée et apparaît comme un horizon indépassable. Le principe de l'émission qui repose sur la mise en scène d'une supposée intimité (logement de l'agriculteur, vie quotidienne sur l'exploitation, rapprochement entre les couples, ...) s'inscrit dans un double clivage : homme/femme et rural-agricole/urbain qui est en permanence performé. Alors que le programme prétend donner à voir une authenticité (authenticité des paysages et des valeurs rurales, de ces hommes qui sont d'honnêtes travailleurs, des sentiments et des affects), il révèle les contraintes sociales et les attentes en terme de rôle de sexe qui pèsent sur ces femmes et ces hommes. Je m'attacherai à décrire ces performances, à partir de l'analyse des différentes saisons de l'émission, afin d'en montrer les enjeux sociaux et spatiaux en vue de repenser la question de la rencontre amoureuse dans le cadre du « capitalisme émotionnel » (Illouz, 2007) et d'une mise en scène de l'authenticité fondée en nature.



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IGU 2015 – 3318

## The model of the Geosocial process reflecting the relation between the natural and social disasters

*Marina VIKULINA, A.A. DOLGAYA, A.V. VIKULIN, A.S. TURCHANINOVA (Russian Federation)*

The analysis has shown that all biological crises on the planet over the last 600 million years (human separation in independent genus; all the main stages of Homo sapience and society formation; the rise and fall of civilizations, empires and states) were preceded and accompanied by natural disasters (climatic anomalies, floods and droughts, earthquakes, volcanic eruptions, etc.), which confirms the well-known Aristotle-Leibniz-Mach principle of indissoluble unity of the physical and spiritual world. Natural disasters and social events accompany each other throughout human civilization, thus reflecting the close relationship of these phenomena that are seemingly of different nature. In order to study this relationship authors compiled and analyzed the list of the 2,400 natural disasters and social phenomena weighted by their magnitude that occurred during the last XXXVI centuries of our history. Statistical analysis was performed separately for each aggregate (natural disasters and social phenomena), and for particular statistically representative types of events. It is shown that the numbers of events in the list are distributed by logarithmic law: the bigger the event, the less likely it happens. For each type of events and each aggregate the existence of periodicities with periods of 280 ± 60 years was established. The compiled list of events and first identified properties of cyclicity, grouping and interaction process are the basis of modeling essentially unified Geosocial process at high enough statistical level. Proof of interaction between "lifeless" Nature and Society is fundamental and provided a new forecasting approach of demographic crises taking into the account both natural disasters and social phenomena.



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# C12.09 Environment Evolution

## Climate - vegetation interaction under current and future climate change scenarios 1

**Chairperson(s):** *Alexander OLCHEV*

- Impacts Of Climate Change On Tribal Life In India
  *Chikka SWAMY (India)*
- Human exposure to environmental health concern by types of Mediterranean urban environments
  *Izhak SCHNELL, O. POTCHTER, Y. YAAKOV, Y. EPSTEIN (Israel)*
- Future Sea Level estimation based on the paleoclimate data
  *Leonid SOROKIN (Russian Federation)*

## Climate - vegetation interaction under current and future climate change scenarios 2

**Chairperson(s):** *Alexander OLCHEV*

- Influence of the Huancabamba depression in the evolutionary process of the flora adaptation
  *Ana SABOGAL (Peru)*
- Assesment of NDVI reaction to precipitation and temperature in temporal and spatial domains on a country scale
  *Maksim KULIKOV (Kyrgyzstan)*
- Long-term changes hydrothermal conditions in Predbaikalie
  *Nadezhda VOROPAY, Elena MAKSYUTOVA (Russian Federation)*

## Climate - vegetation interaction under current and future climate change scenarios 3

**Chairperson(s):** *Alexander OLCHEV*

- Estimation of CO2 and H2O fluxes for a forest mire using field measurements and model calculations
  *Alexander OLCHEV, E. VOLKOVA, T. KARATAEVA, Elena NOVENKO (Russian Federation)*
- Mathematical modeling of greenhouse gases in the area with heterogeneous relief and vegetation
  *Yulia MUKHARTOVA, Alexander OLCHEV, Natalia LEVASHOVA (Russian Federation)*
- The contrast structures theory application for multi-dimensional mathematical modelling of the interaction of air fluxes and vegetation



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*Natalia LEVASHOVA, Yulia MUKHARTOVA, Alexander OLCHEV (Russian Federation)*

- Effect of clear-cutting on soil CO2 emission

  *Alexander MOLCHANOV, Alexander OLCHEV (Russian Federation)*

- Evolutionary biogeography of a genus of trees - from molecules to global distribution

  *Avi GOLAN-GOLDHIRSH, Giorgi KOZHORIDZE, Nicolai ORLOVSKY, Lea ORLOVSKy, Dan G. BLUMBERG (Israel)*

**Environment Evolution and Human Activity in the late Quaternary 1**

**Chairperson(s):** *Andrei VELICHKO, Tamara YANINA, Taibao YANG*

- Environment Evolution and Human Activity in the late Quaternary'
  Introduction of the session and presentation of the Environment Evolution Commission

  *Andrei VELICHKO (Russian Federation)*

- Comparative analysis of the climatic and environmental changes in the arid and semi-arid regions of Eurasia over the last million years recorded in loess-soil deposits on the South of Russian Plain and the Chinese Loess Plateau

  *Taibao YANG (China)*

- The Caspian Region: Environmental consequences of the global climate change during the Late Pleistocene

  *Tamara YANINA, V. SOROKIN, A. SVITOCH (Russian Federation)*

- Quaternary Environmental Changes in the Sahara and the Arabian Desert

  *Mahmoud Mohamed ASHOUR (Egypt)*

**Environment Evolution and Human Activity in the late Quaternary 2**

**Chairperson(s):** *Andrei VELICHKO, Tamara YANINA, Taibao YANG*

- Intervals of rapid landscape and climate changes in the Late Pleistocene: Evidence from central Russian Plain

  *Olga BORISOVA (Russian Federation)*

- Palaeoecological evidence for the middle and late Holocene lake-swamp vegetation in the Oka River basin (European Russia)

  *Inna ZYUGANOVA, Elena VOLKOVA (Russian Federation)*

- Climate change, grain harvest fluctuation and social rise and fall in China over the past two millennia

  *Yin JUN, Fang XIUQI, Su YUN (China (Beijing))*



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- Quantitative reconstruction of hydrological regime in a peatland ecosystem in the modern forest-steppe region during the Holocene

  *Andrey TSYGANOV, Viktor CHERNYSHOV, Kirill BABESHKO, Yuri MAZEI (Russian Federation)*

- Valdaian (Weichselian) Terraces in River Valleys of the Central Russian Plain

  *Ekaterina MATLAKHOVA, Andrei PANIN (Russian Federation)*

**Environment Evolution and Human Activity in the late Quaternary 3**

**Chairperson(s):** *Andrei VELICHKO, Tamara YANINA, Taibao YANG*

- Historical trends of ecosystem services utilization in the landscapes of Germany

  *Mikhail LIBERMAN, Emma ROMANOVA (Russian Federation)*

- Transmission of climate change impacts from temperature change to grain harvests, famines and peasant uprisings in the historical China

  *Fang XIUQI, Su YUN, Yin JUN, Teng JINGCHAO (China (Beijing))*

- Hydraulic modelling of the Black Sea level change during the last 21,000 years

  *Aleksey SIDORCHUK, O. BORISOVA, A. PANIN (Russian Federation)*

- Evolution of technogenic landscapes on the territory of Verhnekamskoye Potash Deposit

  *Elena KHAYRULINA, N.G. MAKSIMOVICH (Russian Federation)*

- Early Holocene vegetation and climate dynamics in the central part of the European Russia

  *Alexander OLCHEV, E. NOVENKO (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium 1**

**Chairperson(s):** *Elena NOVENKO, Daniil KOZLOV*

- Landscape dynamics and human impacts during the last millennium Introduction of the session and presentation of the Environment Evolution Commission

  *Elena NOVENKO (Russian Federation)*

- Dynamics, socio-economic and biophysical drivers of land-cover change in the former Virgin Lands Campaign area of Kazakhstan

  *Alexander PRISHCHEPOV, Daniel MÜLLER, Brett HANKERSON, Tobias KUEMMERLE, Andrey DARA (Denmark)*

- Global Carbon Mitigation Cooperation Scheme

  *Changxin LIU, Zheng WANG, Yuan TIAN, Rui HUANG (China (Beijing))*



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**Landscape dynamics and human impacts during the last millennium 2**

**Chairperson(s):** *Elena NOVENKO, Daniil KOZLOV*

- Measuring urban sprawl using Landsat and night-time images: Case Study of Hyderabad, India

  *Koel ROYCHOWDHURY (India)*

- Geoecological assessment of territories using global and regional databases

  *Marina ARSHINOVA, Ali ALYAUTDINOV, Emma ROMANOVA (Russian Federation)*

- Integrated analysis of land cover changes in the forest-steppe region of Russia

  *Elizaveta KHAZIEVA (Russian Federation)*

- Landscape analysis of the Crimean Peninsula in the context of climate change and new social challenges

  *Vladimir BOKOV, Viktor SMIRNOV (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium 3**

**Chairperson(s):** *Elena NOVENKO, Daniil KOZLOV*

- Initial Stages Of Socio-Natural History Of Landscapes Of Central Russia

  *Kirill GRAVES, V.A. NIZOVTSEV, N.M. ERMAN (Russian Federation)*

- Periodization Of Natural And Human Consistent Parts Of Landscape Evolution In The Forest Zone Of The Russian Plain

  *Vyacheslav NIZOVTSEV (Russian Federation)*

- Intralandscape differentiation of land use changes: identification of the causes and the forecast in the example Borovsky District (Russia) in the XVII-XXI centuries

  *Daniil KOZLOV, A.I. GLUHOV, A.A. GOLUBINSKIY, D.A. KHITROV (Russian Federation)*

- Historically-geographical analysis of socially- ecological trends to optimize recreation potential of the territory

  *Anastasiya KYZNETSOVA, T.A. BARABOSHKINA (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium 4**

**Chairperson(s):** *Elena NOVENKO, Daniil KOZLOV*

- Late Holocene environment dynamics and human activity in the forest-steppe zone of European Russia (satellite and pollen-based reconstructions)

  *Elena NOVENKO (Russian Federation)*



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- Landscape dynamics and human impacts in the Late Holocene in the Ladoga basin
  *Tatyana SAPELKO, Dmitry GERASIMOV, Tatyana GUSENTSOVA (Russian Federation)*
- Land use history of the Meschera Lowland (European Russia) in the XVIII-XXI centuries
  *Viktor MATASOV (Russian Federation)*
- Old Russian City And The Landscape
  *Irina GRAVES, K.K. GRAVES, V.A. NIZOVTSEV, N.M. ERMAN (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium 5**

- Dynamics and evolution of postmeliorated landscapes: A case study of Meschera lowland
  *Tatiana KHARITONOVA, K.N.DIAKONOV (Russian Federation)*
- Changes in landscape components interrelationships after anthropogenic disturbance
  *Ksenia MEREKALOVA (Russian Federation)*
- Land Degradation and Management in Dhaulpur District, Rajasthan, India
  *Rama PRASAD, Rani SINGH (India)*
- Assessment of land use and landscape dynamics contribution to contaminants migration at the example of 137Cs in Bryansk region (European Russia)
  *Kristina NENKO, Vitaly LINNIK, Nadezhda VOLKOVA (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium 6**

**Chairperson(s):** *Elena NOVENKO, Daniil KOZLOV*

- Mountain landscapes: from traditional presentations to modern problems
  *Zulfira GAGAEVA, Umar GAIRABEKOV (Russian Federation)*
- Mountain grasslands of the Central Caucasus: land use heritage and contemporary change
  *Raisa GRACHEVA, Elena BELONOVSKAYA, Vera VINOGRADOVA, Ilya SHORKUNOV (Russian Federation)*
- Succession Changes of CO2 Soil Emissions from post-agrogenic soils: Chernozems as compared to Podzols (European Russia)
  *Dmitry LURI, Dmitry KARELIN, Sergei GORYACHKIN, Arseny KUDIKOV, Vsevolod LUNIN (Russian Federation)*
- The agrogene transformation of steppe-forest landscapes of Central Russian Upland
  *Daniil KOZLOV, Nikolay LOZBENEV (Russian Federation)*
- Carbon stocks and fluxes in the ancient residential areas of the forest zone (European Russia)
  *Andrey DOLGIKH, D. KARELIN, A. KUDIKOV, A. MEDVEDEV, A. SMAGIN (Russian Federation)*



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# POSTER EXIBITION

## Environment Evolution and Human Activity in the late Quaternary

- Carbonate pedofeatures in soils of crio-arid landscapes of Altai Mountains as a proxy of paleoenvironment

  Jessica VASIL'CHUK, Pavel KRECHETOV (Russian Federation)

- The middle and late Holocene landscape dynamics and land use in the central part of the Meshera Lowland (Russia)

  Elena NOVENKO, I.V. MIRONENKO, D. A. KUPRIYANOV, A.K. BATANOVA (Russian Federation)

- Acidity and chemical composition of atmospheric precipitation in the region near Moscow State University

  Irina EREMINA (Russian Federation)

- The Late Khvalynian specific deposition of the Ergeni bench of the Kalmykia

  Radik MAKSHAEV, A.A. SVITOCH, G.V. OSCHEPKOV, D.S. KHOMCHENKO, E.N. BADYOKOVA, T.A. YANINA (Russian Federation)

- Postglacial to Holocene environmental transformation of the Laptev Sea continental margin

  Ekaterina TALDENKOVA, H.A. BAUCH S. , NIKOLAEV, A. STEPANOVA, N. CHISTYAKOVA, Ya. OVSEPYAN, R.F. SPIELHAGEN (Russian Federation)

- Landscape Reconstruction and Human Spatial Organization During Late Holocene in Peripheral Depression of São Paulo State - Brazil, Through Optically Stimulated Luminescence (OSL)

  Danilo PICCOLI NETO, Archimedes Perez FILHO (Brazil)

- Water budget and connection of the Caspian and Black seas during the Late Glacial

  Olga BORISOVA, Aleksey SIDORCHUK, Andrei PANIN (Russian Federation)

- Reconstruction of the Holocene vegetation dynamics of the Sea of Azov Region (Russia)

  Kristina DYUZHOVA (Russian Federation)

- The Dynamics of Development of Watershed Mires on the Middle-Russian Upland (Russia)

  Elena VOLKOVA (Russian Federation)

- Organization of the Biosphere

  Sergey GORSHKOV (Russian Federation)

- Fluvial system response to proglacial crustal deformations at the SE periphery of the Scandinavian Ice Sheet (SIS)

  Andrei PANIN, D.BARANOV (Russian Federation)



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- Landscape preconditions for human settlement in Altai Mountains and Tuva region during the late Holocene

  Anastasia GLEBOVA (Russian Federation)

**Climate - vegetation interaction under current and future climate change scenarios**

- Altered water and heat budget due to Karst Rocky Desertification in southwest China can influence regional climate

  *Jiangbo GAO, Shaohong WU, Yongkang XUE (China)*

- Drought and grain crop yields in the East European Plain under influence of quasi-biennial oscillation of global atmospheric processes

  *Elena CHERENKOVA, Alexander N. ZOLOTOKRYLIN, Mikhail BARDIN, Inna SEMENOVA (Russian Federation)*

- Impact of agroclimatic conditions on winter rye yields in the Central Nonblack Soil Zone

  *O.E. SUKHOVEEVA (Russian Federation)*

- Dimensions of Climate Change and Its Impact on Land and Society in Indian Western Himalayas

  *Virender Singh NEGI (India)*

- Water demand for the main agricultural crops under climate change impacts in the Oltenia Plain (Romania)

  *Bianca MITRICĂ, Dragotă CARMEN-SOFIA, Ines GRIGORESCU, Monica DUMITRAŞCU, Elena MATEESCU (Romania)*

- Modelling the land-use change effect on local climate in Upper Volga area with COSMO_CLM regional model

  *Pavel KONSTANTINOV, Mikhail VARENTSOV (Russian Federation)*

- Temperature regime of soils as a factor of ecosystems' functioning (on the example of the East European Plain)

  *Olga CHERNITSOVA , Pavel KRECHETOV (Russian Federation)*

- Influence of forest fires in Russia on the gas composition of the atmosphere

  *S.N.ZHARINOV (Russian Federation)*

**Landscape dynamics and human impacts during the last millennium**

- Degradation of arid landscapes of Azerbaijan under anthropogenous pressure

  Elbrus ALIZADE, I.Ya KUCHINSKAYA., S.Yu. GULIYEVA (Azerbaijan)



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- Aerial Photographs of mainland taken by U-2 planes: Its characteristics and interpretation

  *Renya SATO, Kunitada NARUMI, Shigeru KOBAYASHI (Japan)*

- The reconstruction of historical landscapes of northern forest-steppe in the valley of the Upper Don

  *Evgenia GORSKAYA, Alexander ALEKSANDROVSKY, Maya GLASKO (Russian Federation)*

- Soil pH hyper-spectral inversion of oases in arid areas

  *Hei-gang XIONG, Kai-long WANG1, Fang ZHANG (China)*

- Land use dynamics in the southern part of Valdai hills in the XVIII – XX centuries

  *Pavel SHILOV (Russian Federation)*

- Landscape Dynamic Mapping of The Lesunovo station (The Meshchera Region)

  *Iya MIRONENKO (Russian Federation)*

- Agroecological land evaluation and land use of the Ustianskoe plateau (southern Arkhangelsk oblast)

  *Ksenia A. KINGSEP, Alexander I. GLUKHOV, Daniil N. KOZLOV (Russian Federation)*



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**Impacts Of Climate Change On Tribal Life In India**

Chikka SWAMY (India)

Global warming is the 'talk of the town' in this century, A scrutiny of the past records of 100 years indicates that India figures in the first 10 in the world in terms of fatalities and economic losses in a variety of climatic disasters. The key environmental challenges in India have been sharper in the recent decades. Climate change is impacting the natural ecosystems and is expected to have substantial adverse effects on tribal life, mainly on forest and agriculture on which still larger per cent of the population still depends for livelihood. Climate change which has increased frequency of extreme events such as floods, and droughts has directly impact on tribes food security problems and water security. A scientific consensus has emerged in recent decades that human activities are causing considerable changes to our climate. These trends will continue even if significant policy changes are not made, and they will grow much worse if we do little or nothing to address the problem as first priority in fragile regions like natural forest, tribal settlements, biodiversity zones etc. However, an effective solution to climate change demands broad national and state policy and federal legislation. For any such legal and policy framework to be truly comprehensive, policymakers must consider how climate change affects Native communities. Traditional tribal practices and relationships with the natural world premature forms like, the spiritual, cultural, and economic foundation for many were threatened by climate change. In addition, the effects of climate change will fall disproportionately on tribes. For example, tribes in chamarajanagar district of Karnataka state in India though contribute very little to the anthropogenic drivers of climate change in the region , yet impacts of climate change on them are important on ethical reasons as they are valuable native communities of the region.



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**Human exposure to environmental health concern by types of Mediterranean urban environments**

Izhak SCHNELL, O. POTCHTER, Y. YAAKOV, Y. EPSTEIN (Israel)

This study classifies urban indoor and outdoor environments into types characterized by different combinations of exposure to environmental risk factors and measures average levels of sense of discomfort and Heart Rate Variability (HRV) produced in each of these types of environments. We hypothesize that a set of measurements taken by the same individuals in different types of urban environments in a random way can provide a better understanding of the distribution of human exposure to environmental loads throughout the urban space than results calculated based on measurements from close fixed stations. We measured human exposure to a set of environmental factors; micro-climatic, CO and noise and individual Hart rate and calculated thermal sensation, HRV and Subjective Social Stress (SSS) and Sense of Discomfort by questionnaire survey. The results demonstrate deep differences in exposure to environmental factors among 8 types of urban environments, deep differences in health risks and sense of discomfort produced in these types of environments and differences in the levels of discomfort vs. HRV produced in half of the types of environments. Parks and apartments prove themselves as the more relaxing environments in the city and noisy and crowded environment appears to be the more risky ones. It appears that noise and social sense of stress are the more significant environmental factors to enhance health risks and discomfort.



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**Future Sea Level estimation based on the paleoclimate data**

Leonid SOROKIN (Russian Federation)

In the present time we have no valid model of Sea Level change as a response on climate change and the important model parameters are not defined. Otherwise the current climate conditions are well known and the stationary solution for the future climate can be made with the help of the paleoclimate data. On the base of the logistic function we make an estimation of the future Sea Level change as a function of Earth Global Surface Air Temperature. Other model parameters are responsible for relaxation process. The main model application is the estimation of the economic losses from climate change for the different scenarios of global warming. The EU Strategy on adaptation to climate change assumes that the global warming must be limited to below 2 °C above pre-industrial level. Hence, within some ages this will lead to a rise of the Sea-level of 15 meters (e.g. 15 times greater than for the A1B scenario, with the Sea-level rise up to 1 meter). Considering the future conditions, the EU Strategy on adaptation to climate change does not assume rapid climate changes that will significantly increase the economic losses due to the rise of the Sea Level.



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**Influence of the Huancabamba depression in the evolutionary process of the flora adaptation**

Ana SABOGAL (Peru)

The Huancabamba depression of the Andes, situated in north of Peru, is the smallest and narrow point of the western Andean mountain. The Pacific and Amazonian vegetation is here represented and build the Marañon forest. The deep valleys have here a big slop that causes a hart erosion. In this space the humidity come from both direction, from the west and from the east, this fhöns wind are hot and dry because of the absence of Andean barrier. That is also the cause that the Huancabamba basin has the influence of the El Niño Event. The humidity transport originates in the Amazonian forest; originate the rain in this region. A big difference of humidity is characteristic for this area; the valleys protected from wind remain dry, and the other more humid. The consequence is a big diversity of ecosystems in a small area. Other factor characteristic for the valley is the thermal inversion. As consequence, the Huancambamba depression is not a phyto-geographical barrier for the plant dispersion. A huge endemism is characteristic for the vegetation of this area, as consequence of the micro-climate. The plants developed ecotyps, adapted to this peculiar climate. They are not a lot of ecological study for this space. The question is or we can speak about an evolutionary process of the flora from this space with a strong flexibility, and or this adaptation can by interesting on the time of Climate change scene in the Amazonian basis.



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**Assesment of NDVI reaction to precipitation and temperature in temporal and spatial domains on a country scale**

Maksim KULIKOV (Kyrgyzstan)

Kyrgyzstan is a country depending on its natural resources and agriculture. The mountain ecosystems are very fragile and can be easily damaged by unsustainable management or changing conditions. Climate change scenarios for Kyrgyzstan suggest the country will go through a series of impacts, which may require a new nature resources management approach to avoid severe consequences for the ecosystems and national economy. With these regards it is important to understand he links and interactions between the natural resources and climate features. In this study we decompose NDVI, precipitation and land surface temperature raster time series into trend and seasonal components on a pixel basis. The factors that were not taken into account but contributing to the uncertainties include soil and geology, as well as different vegetation types and water streams. We study lagged correlations between the variables and identify the degree of NDVI fluctuations conditioned by precipitation and land surface temperature. Cluster analysis is used to identify the pattern of homogenous groups of NDVI, precipitation and land surface temperature interactions. As Kyrgyzstan is a mountain country with different altitudinal belts and ecosystems concentrated on a relatively small area the results show the different bioclimatic regions, which are conditioned by altitude, terrain and exposedness to different precipitation levels. The results also indicate that NDVI is mainly conditioned by the climate factors following the terrain pattern.



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**Long-term changes hydrothermal conditions in Predbaikalie**

Nadezhda VOROPAY, Elena MAKSYUTOVA (Russian Federation)

Structural and functional characteristics of landscapes are undergoing significant changes as a result of long-term variability of natural and anthropogenic environmental factors. In extreme situations, landscapes can be completely transformed. The Ped' index (Si) is calculated to estimate the long-term changes of hydrothermal conditions at the territory of Predbaikalie. The Ped' index is the ratio of temperature and precipitation anomalies for May-September for one year. The index for each year is compared to the mean values for 1941-2010. Studied weather stations are located in different geographical conditions. Landscapes of plains and plateaus (central taiga, south taiga, steppe and forest-steppe) and landscapes of mountains (taiga, tundra, bald and nival) are considered. Offensive atmospheric drought is possible in any month of the growing season. Weak droughts are observed in 15-17%, average droughts - 6-8%, strong droughts - in 1-3% of cases on average for the study area. Pair correlation coefficients between Si index of weather stations are distributed evenly throughout the growing period. Coefficients between weather stations located in steppe and forest-steppe zone are higher than between weather stations in taiga , they are varies 0.7-0.9 and 0.3-0.7, respectively. First months of the growing season are the most arid for all landscapes, past months are the most moisturized. Dependence of aridity from climate change is analyzed. It is known that the main contribution to the increase of annual air temperatures are make changes in temperature during winter months. Trends in temperature and precipitation in the summer did not have a significant impact on the course of the Si index. During the observation period, only oscillations are registered there is no statistically significant trends.



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**Estimation of CO2 and H2O fluxes for a forest mire using field measurements and model calculations**

Alexander OLCHEV, E. VOLKOVA, T. KARATAEVA, Elena NOVENKO (Russian Federation)

Forest and mire ecosystems play a very important role in balance of CO2 and H2O in the atmosphere as a key greenhouse gases influencing the climatic system and having a key responsibility for modern changes of climate. The contribution of mire ecosystems of European Russia in balance of the main greenhouse gases in the atmosphere is still very poorly investigated mainly due to limited field studies carried out in the area and very heterogeneous and mosaic structure of mires that makes difficult an adequate application of any modern measuring techniques (e.g. eddy covariance). Within the framework of the study the CO2 and H2O fluxes of a forest mire situated in Tula region were described using field chamber measurements and 3D modeling approach. The area of the mire is about 1.2 ha and it is surrounded by a broadleaved forest stand. It is typical peat mire according to water and mineral supply as well as to vegetation composition. The vegetation of the peripheral parts of the mire is typical eutrophic whereas the vegetation in its central part is represented by meso-oligothrophic plant communities. To describe the spatial variability of CO2 and H2O fluxes within the mire a portable measuring system consisting of a transparent ventilated chamber combined with an infrared CO2/H2O analyzer LI-840A (Li-Cor, USA) was used. The measurements were provided along transect from the southern peripheral part of the mire to its centre under sunny clear-sky weather conditions. To estimate the total mire CO2 and H2O fluxes the process-based Mixfor-3D model was applied. The model allows taking into account the spatial heterogeneity of solar radiation, thermal and soil moisture conditions within the mire and surrounding forest. Parameters describing the photosynthesis, respiration and transpiration variability were derived from results of the field measurements. The results of field measurements and model estimations showed a significant spatial and temporal variability of CO2 and H2O fluxes that were mainly influenced by incoming solar radiation, air temperature and ground water level. Under sunny weather for summer month the central part of the mire was a sink of CO2 from the atmosphere and total daily CO2 flux reached -2.0 .. -3.0 gC m-2 day-1. The peripheral parts of the mire were a source of CO2 for the atmosphere (1.0 - 2.0 gC m-2 day-1). In cloudy days the daily CO2 flux in the central part of the mire was about zero (-0.2 - 0.0 gC m-2 day-1). Periferal parts of the mire were a source of CO2 for the atmosphere. The actual evaporation in sunny days reached 3.5 mm day-1, and in cloudy on average didn't exceed 0.6-1.0 mm day-1. This study was supported by the Russian Science Foundation (Grant 14-14-00956).



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IGU2015 – 3398

**Mathematical modeling of greenhouse gases in the area with heterogeneous relief and vegetation**

Yulia MUKHARTOVA, Alexander OLCHEV, Natalia LEVASHOVA (Russian Federation)

The main goal of the study is to describe the influence of spatial vegetation and relief heterogeneity on turbulent greenhouse gases fluxes between land surface and the atmosphere using a process-based two-dimensional turbulent exchange model. As a key area for this modeling study the hilly territory situated at the southern boundary of broadleaf forest community of European Russia (Tula region) was selected. The vegetation cover in the region is mainly represented by mosaic of agricultural areas, grasslands, mires and groves that makes adequate determining the local and regional fluxes of gases using experimental approaches very difficult. Applied two-dimensional model based on solution of the averaged Navier–Stokes and continuity equations using the one-and-a-half order (TKE) closure scheme. For description of plant canopy photosynthesis and respiration an aggregated approach based on model of Ball et al (1987) in Leuning modification (1990, 1995), the Beer-Lambert equation for the description of solar radiation penetration within a plant canopy (Monsi, Saeki 1953), and also an algorithm describing the response of stomatal conductance of leaves to incoming photosynthetically active radiation is used. All necessary input parameters describing the photosynthesis and respiration properties of plants and soil were obtained from the field measurements or taken from the literature. To quantify the possible effect of relief and vegetation heterogeneity on passive tracers fluxes the space distributions of wind velocity components, turbulent kinetic energy, turbulent coefficient, concentrations of transported gases, and their fluxes at different heights were calculated for actual vegetation structure and for scenario assuming total deforestation. The modeling results provided showed a significant impact of both relief and vegetation heterogeneity on greenhouse gases fluxes. This study was supported by the Russian Science Foundation (Grant 14-14-00956).



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**The contrast structures theory application for multi-dimensional mathematical modelling of the interaction of air fluxes and vegetation**

Natalia LEVASHOVA, Yulia MUKHARTOVA, Alexander OLCHEV (Russian Federation)

The study was focused to develop a new modeling approach that allows to describe adequately the turbulent transport of the different green-house gases between heterogeneous land surface vegetation and the atmosphere. Adequate flux parameterization of the key green-house gases such as CO2 and H2O give as possibility to quantify their local and regional fluxes and estimate their possible effect to climate. The mathematical modeling of air transport processes is actually a very complicated problem. Within framework of the study to describe exchange processes we developed two-dimensional model based on the theory of contrast structures (CS). CS is a function describing the abrupt change of some unknown parameter within some interior transition layer. In our study the CS theory is used to solve the system of the transport equations. Application of CS was justified by the fact that the graphs of the functions characterizing air fluxes above the heterogeneous vegetation always have some transition layers. Developed two-dimensional model was applied to describe the air flow and CO2 and H2O exchange processes around the forest clearings and protective forest belts. This study was supported by grant from the Russian Foundation for Basic Research (RFBR 14-04-01568-a and 13–01–00200-a)



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**Effect of clear-cutting on soil CO2 emission**

Alexander MOLCHANOV, Alexander OLCHEV (Russian Federation)

Effect of clear-cutting of forests on CO2 emission from soil surface was investigated using results of the field measurements. The measurements were provided from August to November of 2014 in Moscow region. Carbon dioxide (CO2) is very important greenhouse gas that is according to numerical studies mainly responsible for modern global warming. Forests are very strong sink of CO2 from the atmosphere and intensive deforestation can obviously lead to reduction of CO2 uptake and increase of CO2 concentration in the atmosphere. The CO2 flux measurements were simultaneously provided both in several plots within the surrounding undisturbed spruce forest stands close to clear-cut and in plots within the clear-cut area with various degree of soil surface damaging (undisturbed soil surface, soil covered by dry needles and sawdust, soils with completely or partly disturbed upper layer). The results of field measurements showed large differences in CO2 emission rates between clear-cutting and forest plots. In particular, during the measuring period the soil CO2 emission at clear-cutting plots at least in two times exceeded the soil CO2 emission from forest plots. Such differences can be explained, first of all, by differences in moisture and temperature of the upper soil layer between clear-cut and forest plots. The measurements showed that the mean volumetric soil moisture of the upper soil layer within clear-cut area was about 42%, whereas the soil moisture at control plots was about 16.5% only. The measurements also showed that the maximal CO2 emission was observed in clear-cut plots in which the soil surface was covered by dry needles and sawdust. Minimal CO2 emission was measured al plots in which the upper soil layer was damaged by logging equipment. This study was supported by the Russian Science Foundation (Grant 14-14-00956)



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**Evolutionary biogeography of a genus of trees - from molecules to global distribution**

Avi GOLAN-GOLDHIRSH, Giorgi KOZHORIDZE, Nicolai ORLOVSKY, Lea ORLOVSKy, Dan G. BLUMBERG (Israel)

The genus Pistacia L. (Anacardiaceae) consists of 11 species of trees. Six species are distributed from the Mediterranean basin to Central Asia (P. atlantica, P. khinjuk, P. lentiscus, P. palaestina, P. terebinthus, and P. vera), two species in Eastern Asia (P. chinensis and P. weinmannifolia), and two species from the Southwestern United States to Central America (P. mexicana and P. texana). Pistacia aethiopica was defined as a new species in 1980 by J. O. Kokwaro, however, its systematic status has not been fully evaluated. We present the evolution of projects from the isolation and characterization of a dehydrin protein from inflorescence buds of Pistacia vera related to cold tolerance, via morphological and molecular markers, up to our current research on the global geographic distribution of species of the genus in relation to arid and semiarid zones and long-term climate change. Molecular, Geographic Information System (GIS) and remote sensing methods have been used. We hypothesized that long-term global climate episodes affected differentially the various species, limiting the distribution of those that are more vulnerable to drought and heat and vice versa in relation to the tolerant species. A better understanding of the species distribution related to drought, temperature change tolerance, and soil requirements will be presented. The availability at the Blaustein Institutes for Desert Research (BIDR) of an extensive germplasm collection of Pistacia from various geographical regions around the globe has made it possible to evaluate their genetic relationships and the evolution of the genus.



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**The Caspian Region: Environmental consequences of the global climate change during the Late Pleistocene**

Tamara YANINA, V. SOROKIN, A. SVITOCH (Russian Federation)

The event scheme of the Caspian Late Pleistocene includes Late Khazarian, Girkanian and three stages of Khvalynian transgressive epochs, separated by the regressions. Many questions of the paleogeography of these events are debatable. Our conclusions are based on materials of complex studying of numerous sections of the recent deposits of the Caspian Sea Coast and the sequences of the boreholes up to 100 m drilled in the Northern Caspian Sea. Late Khazarian and Girkanian transgressions developed during MIS 5. The maximum level of Girkanian transgression and drain of its waters across the Manych to the Black Sea basin took place in a transition period from interglacial to glacial climatic conditions. The Atelian regression was a response of the Caspian Sea to severe continental climate of the cold maximum in the Early Valdai stage (MIS 4) of the glacial epoch. The first stage of the Khvalynian transgression took place during the interstadial warming (MIS 3). The Khvalynian transgression was interrupted during the stage of the maximum cold and dryness of the LGM (MIS 2). The transgression was resumed during the epoch of the glacial degradation. The Khvalynian epoch is noted by two stages of the dumping of the Caspian waters to the Pont: in the maximum (48-50 m) and Burtass (20-22 m) phases of the transgression. The continentalization of the early Holocene led to the Mangyshlak regression of the Caspian Sea.



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IGU2015 – 3192

**Quaternary Environmental Changes in the Sahara and the Arabian Desert**

Mahmoud Mohamed ASHOUR (Egypt)

The study of the Sahara and the Arabian deserts during the of Quaternary period is one of the most important keys or stone corner in the discovery and clarifying the sequence of environmental events. Not only because it lies at the heart of the hyper arid belt of the world and extends to the south of the Mediterranean coast, but because it witnessed human activities during the Quaternary and comprises many evidences of different origin and varied magnitudes. Evidences can be split in: 1-Geomorphologic evidences: a- Wadis and Wadis Sediments b- Caves c- Tufa platforms d- Spring Mounds e-Playas f- Sand Dunes and Sand Sheets g- Duricrusts h- Amphitheaters. i- Karst sinkholes 2-Archaeological a- Living Sites b- Fire Places c- Potsherds d- Stone Artifacts e- Drawings 3- Bio evidences a- Ostrich Eggshells b- Algal Mats c- Silicified Wood. In this paper these evidences will be discussed in detail in some parts of Egypt and briefly in other parts of the Sahara and the Arabian Deserts.



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IGU2015 – 2697

**Intervals of rapid landscape and climate changes in the Late Pleistocene: Evidence from central Russian Plain**

Olga BORISOVA (Russian Federation)

The greatest rates of climate changes were characteristic for transitional phases of the interglacial/glacial cycles, including the last cycle, which comprised the Eemian (Mikulino) Interglaciation and the Weichselian (Valdai) Glaciation. Estimations of duration of the Last Interglacial main phases based on the calculations of annual layers in lake sediments, as well as on correlations of pollen profiles with changes in the isotopic composition in Greenland ice cores, indicate that the interglacial/glacial transitional phase (the regional pollen zone E7/M8) spanned 7 to 8 thousand years, while the most rapid cooling at its beginning occurred during 2-3 thousand years. Temperature reconstructions with the use of palaeofloristic method combined with these estimations show that during the post-optimal part of the Last Interglacial the mean annual temperature on the central Russian Plain decreased by app. 0.03°C per 100 years. During the transitional phase to the Last Glaciation the speed of cooling increased by an order of magnitude, reaching about 0.2°C per 100 years, mainly due to the decrease in winter temperatures. During two main stages of the lateglacial warming (at the Oldest Dryas/Bølling and Younger Dryas/Holocene transitions) the rates of temperature rise in the central Russian Plain reached 0.5-0.7°C per 100 years, which is comparable with the mean rate of the warming for the 20th century. Such rapid climate changes brought about a dramatic response in the landscapes, including restructuring of the complex (mosaic) vegetation cover, high intensity of wind and water erosion, etc.



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**Palaeoecological evidence for the middle and late Holocene lake-swamp vegetation in the Oka River basin (European Russia)**

Inna ZYUGANOVA, Elena VOLKOVA (Russian Federation)

New plant macrofossil data, backed by radiocarbon dates, was obtained from the Holocene section situated in the Yasnaya Polyana estate-museum territory (Tula region, European Russia). The studied area is located near the southern limit of the broad-leaved forest zone. The 5 m peat core was obtained from the Istochek eutrophic mire. According to radiocarbon data, the peat accumulation began nearly 6563 ± 99 cal. YBP. The carpological assemblages dominated by seeds and fruits of aquatic and wetland plants were revealed from the lower part of the peat (400 - 465 cm). The remains of aquatic macrophytes are represented by seeds of Nuphar lutea and endocarps of pondweeds (Potamogeton natans, P. obtusifolius, P. pectinatus, P. graminaeus). The numerous seeds and fruits of coastal plants (Sparganium emersum, Alisma plantago-aquatica, Sagittaria sagittifolia, Schoenoplectus lacustris, Typha latifolia) were identified. Among the remains of the swamp and wet meadow plants fruits of Eleocharis palustris, Cyperus glomeratus, Lycopus europaeus, Ranunculus sceleratus, R. repens et al. were determined. Trees are represented by fruits of birch (Betula pubescens) and alder (Alnus glutinosa). Of interest is a find of an endocarp of European dwarf cherry (Prunus fruticosa). This species is typical for steppe plant communities. Plant macrofossil data allows to reconstruct local vegetation of the eutrophic lake which existed under conditions of warm and mild climate of the climatic optimum of the Holocene (6563 ± 99 - 5473 ± 118 cal. YBP). The forest vegetation dynamics will be reconstructed on the basis of the pollen data. This study was supported by RFBR grant 14-05-00550



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**Climate change, grain harvest fluctuation and social rise and fall in China over the past two millennia**

Yin JUN, Fang XIUQI, Su YUN (China (Beijing))

The relation between climate change and historical rhythms has long been discussed; however, this type of study still faces the lack of high-resolution data of long-term socio-economic processes. In this study, we collected 1941 items of direct and proffered evidence from 25 Chinese history books. By analysing the semantics of words, we reconstructed a quantitative series of the social rise and fall of the past 2000 years with a 10-year resolution to express the phase transition of social rise and fall of dynasties in China. Our reconstruction shows the social vicissitudes have obvious cyclical feature in multiple time scales. Then, comparing with the climate change and grain harvest sequences, the association of social rise and fall with climate change and grain harvest fluctuation was analysed. The results show that social rise mostly occurred in centennial-scale warm periods, whereas social fall mostly occurred in centennial-scale cold periods. Temperature displayed more significant effects on the social fluctuation within the long term, while precipitation displayed more significant effects on the social fluctuation within the short term. Under warm-wet conditions, the grade of social rise was over 57%; under cold-dry conditions, the grade of social fall was over 66%. In addition social rise mostly coincided well with the agricultural relatively harvest periods, whereas social fall mostly coincided with the poor periods. Lastly, during the period 210 BC-1910 AD, there occurred a total of 15 dynastical replacements, and 13 dynastical replacements coincided well with the cold stages and cooling phases, 12 dynastical replacements coincided well with the agricultural relatively poor periods. It is found that social crisis, social unrest and dynastical collapse in China usually appeared during the centennial-scale climatic cooling phases.



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**Quantitative reconstruction of hydrological regime in a peatland ecosystem in the modern forest-steppe region during the Holocene**

Andrey TSYGANOV, Viktor CHERNYSHOV, Kirill BABESHKO, Yuri MAZEI (Russian Federation)

Reconstruction of local hydrological conditions is important for understanding of peatland ecosystems development during the late Holocene. Here we present a quantitative reconstruction of palaeohydrological regime in a peatland ecosystem located in the forest-steppe region (Penza region, Russia) basing on a peat-based testate amoeba record. In order to infer the past water table depths, we developed and apply transfer function using modern ecological preferences of testate amoebae. The reconstruction revealed wet and dry periods corresponding to the various developmental states of the peatland ecosystem that might be used to provide additional context to the multi-proxy reconstructions. This work was funded by the grants of the Russian Foundation for Basic Research (14-04-31472) and by the Ministry of Education and Science of the Russian Federation within the frameworks of financial support to the Penza State University for scientific research in 2014–2016 (project 1315).



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**Valdaian (Weichselian) Terraces in River Valleys of the Central Russian Plain**

Ekaterina MATLAKHOVA, Andrei PANIN (Russian Federation)

Morphology and sedimentary composition of low terraces of the Seim and Khoper rivers (the middle Dnieper catchment and the middle Don catchment respectively) were studied by examination of natural exposures, coring, DGPS topographic profiling, grain size and spore-pollen analysis, 14C and OSL dating, microscopic study of quartz grains. The results were used to establish conditions and chronology of river valleys development and formation of terraces in Late Pleistocene. Study of the Seim and Khoper River Valleys demonstrates that the Valdai (Weichselian) cold epoch (MIS 5d – MIS 2) was characterized by succession of incision / aggradation phases and high amplitudes of river runoff changes (much higher than in the Holocene). The Early Valdai was characterized by low runoff and accumulation in the river valleys. Mid and Late Valdai were characterized by several time spans of high runoff divided by low runoff intervals. Our studies show the following results. River incision was detected 40-30 and 18-13 ka BP (cal). Numerous now relict macromeanders were formed in river valleys 18-13 ka BP (cal). The two intervals of incision were divided by the stage of aggradation in river valleys during LGM (23-20 ka BP cal). Also it was found that Late Pleistocene river terraces were subject to complex (first of all aeolian) reworking during LGM. The results exhibit wide participation of aeolian and slope wash sediments in terrace deposits, deep aeolian reworking of terrace alluvium during LGM. This deep aeolian reworking led to the formation of aeolian covers and aeolian aprons in the river valleys. So the morphology of river valleys (macromeanders, aeolian aprons, etc.) indicates contrasting runoff variations being the characteristic feature of the Valdai (Weichselian) cold stage.



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**Historical trends of ecosystem services utilization in the landscapes of Germany**

Mikhail LIBERMAN, Emma ROMANOVA (Russian Federation)

Five regions with different landscape structure and specific anthropogenic transformation have formed within the territory of Germany. The combination and the relative importance of natural and anthropogenic factors allow subdividing the chronostructural process into several stages. During the 1st stage (subboreal period of the Holocene) natural factors of landscape evolution predominated. At that stage people utilized just small part of ecosystem services (for hunting, fishing, gathering, construction of dwellings), and their impact on landscapes was negligible. The 2nd stage (Roman colonization, before the IV century a.c.) was characterized by diversification of ecological services utilized by people, construction of towns, roads and bridges and large-scale plowing. During the 3rd stage (preindustrial period, IV-XVII centuries) ecosystem services became a key point in the transformation of natural landscape. The inner structure of landscapes gained a mosaic pattern. The 4th stage (industrial period, XVII – middle of the XX century) was marked by growing importance of mineral resources as an ecosystem service. Technogenic landscapes appeared, natural forests were replaced with plantations and arable lands widely ameliorated. During the recent period (post-industrial, since the middle of XX century) landscapes are considered not only as a source of natural resources, but increasingly a basis of supporting and recreational services. The GIS-based calculations resulted in a series of maps illustrating the changes in priorities of and demand for ecosystem services of five natural regions of Germany during different historical stages. This provides for the analysis of correlations between the utilization of ecosystem services and the structure of the present-day landscapes.



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**Transmission of climate change impacts from temperature change to grain harvests, famines and peasant uprisings in the historical China**

Fang XIUQI, Su YUN, Yin JUN, Teng JINGCHAO (China (Beijing))

Because of the complexity of social responses to climate change, as well as limitations of proxy data concerning interactions between climate change and human responses, the social impacts of past climate change and associated response mechanisms, thus, require further investigation. To shed light on the transmission of climate change impacts within historical Chinese society, we selected 30-year resolution sequences of temperature anomalies in eastern China and 10-year resolution sequences of grain harvest grades, famine indices, and frequencies of peasant uprisings in China over the past 2000 years. Using a food security perspective, we analyzed the impacts of temperature changes historically transmitted through Chinese production, population, and social subsystems, and differences in transmission characteristics between cold and warm units. Our results were as follows. (1) From 210 BC to 1910 AD, temperature changes in China were significantly positively correlated with grain harvest grades (correlation coefficient, 0.338), and significantly negatively correlated with famine indices, and frequencies of peasant uprisings (correlation coefficients, −0.301 and −0.277, respectively).The correlation coefficients between famine indices and grain harvest grades or frequencies of peasant uprisings were very low. (2)There was a higher proportion of bumper or normal harvests (86.5% of the total decades), more moderate and mild famines (76%), and a lower proportion of peasant uprisings (33.3%) in the 30-year warm units . Conversely, there was a higher proportion of poor or normal harvests (70.7%), a greater proportion of moderate and severe famines (77.6%), and more peasant uprisings (51.7%) in the 30-year cold units. (3) Of the 23 main transmission pathways extending from temperature change to the social subsystem, 13 occurred in cold units, of which 7 had an endpoint of peasant uprisings, and 10 occurred in warm units of which 3 had an endpoint of peasant uprisings. The main transmission pathways that were more likely to be associated with the impacts of temperature change were: cold " poor harvests " severe famines " more uprisings; cold " poor harvests " moderate famines " more uprisings; warm " bumper harvests " mild famines " no uprisings; warm " bumper harvests " moderate harvests " no uprisings; warm " normal harvests " mild famines " no uprisings; and warm " normal harvests " moderate famines " no uprisings. (4) The transmission of the impacts of temperature change was a complex process. Within this process, famine was most prone to being modulated by human society. In the transmission pathways from the production to the social subsystem, there was a stepwise decrease in the occurrence rate of decades that were probably affected by climate change. In all cold units, 10.4% of decades ending in more uprisings were most likely to be associated with the impacts of temperature change. In all warm units, 47.9% of decades ending in no uprisings were most likely to be associated with the impacts of temperature change. This research can contribute a better understanding on the past interaction mechanisms and processes within the human-climate-ecosystem complex, as well as a better response to the impacts of the ongoing climate change.



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**Hydraulic modelling of the Black Sea level change during the last 21,000 years**

Aleksey SIDORCHUK, O. BORISOVA, A. PANIN (Russian Federation)

One-layer and two-layer hydraulic models were used for calculations of the Black Sea level changes beginning from the Last Glacial Maximum. The longitudinal profiles of the bed of the Bosporus and Dardanelles straits and the Marmara Sea with lithological characteristics were used as the initial conditions. The entrance boundary condition was the changing discharge at the Bosporus Black Sea end, mostly from the East European Plain and the Danube basin. The exit boundary condition at the distant point of the longitudinal profile (at the Aegean Sea) was the changing oceanic level. Loose sediments from both straits were eroded by powerful flow down to the basement rock. The critical point was the altitude of the rock sill in the Dardanelles (-70 m), as that in the Bosporus was lower (-80 m). When the ocean level was lower than the sill, the level of the Black Sea was controlled by discharge from the sea through the straits and by their geometry. At the stage of maximum discharge 20.0-18.5 kyr BP (the "hydrocratic" transgression of the Black Sea) sea level reached -62 m. Later, with diminishing discharge it decreased to -66…67 m. Since 13.7 kyr BP, when the ocean level exceeded the altitude of the Dardanelles sill, the level of the Black Sea, became controlled by the ocean level and close to it. That was the stage of "eustatic" transgression. About 12 kyr BP the fresh water flow from the Black Sea through the Bosporus decreased sufficiently, so that it did not prevent the salt water intrusion from the Marmara Sea any more.



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**Evolution of technogenic landscapes on the territory of Verhnekamskoye Potash Deposit**

Elena KHAYRULINA, N.G. MAKSIMOVICH (Russian Federation)

Verhnekamskoye Potash Deposit is one of the biggest Potash deposit in the world and situated in Western Pre-Kama region. The deposit consists of carnallite, silvenite and halite beds. Salt has been produced since XV century. Two periods are observed in technogenic landscape evolution. The first period (from XV to XX centuries) was connected with rock salt (halite) production. Brine was pumped due to wells and boiling in open pans. Wastes of salt production were residue during evaporation, mainly gypsum, and high mineralized water of a Cl – Na facies. Salinization of surface water and soils was local. The impact of the salt production on the environment was insignificant. The large-scale transformation of the landscapes in Western Pre-Kama region began in the second period of field exploitation from the 30-th years of XX century, when Potash Deposit was discovered and potash mining was actively developed. The main factor that has caused to the environmental issues in the area is accumulation of potash production wastes in large amounts. The waste consists predominantly of some soluble components such as potassium and sodium chlorides and impurities. Drainage water of a Cl – Na facies, with mineralization of about 440 g/L and high content of microelements are actively involved in the surface and subsurface flows, forming a zone of salinity of soils, surface and groundwater. The most affected landscapes are located in the river valley, polluted by the technogenic flows, and near the waste storages. Increasing of concentrations of Cl and Na in soils and water caused the change of terrestrial and aquatic ecosystems on salt resistance, in some cases, up to a full distraction of the ecosystems. This project was funded by RFBR 15-05-07461.



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**Early Holocene vegetation and climate dynamics in the central part of the European Russia**

Alexander OLCHEV, E. NOVENKO (Russian Federation)

The paper presents vegetation and climate reconstructions for the forest zone in the central part of the East European Plain, Russia, for the time period 10000-7900 cal. yr. BP. Reconstructions were based on pollen records from three key regions located in taiga, mixed coniferous-broadleaved and broadleaved forest zones. Obtained results showed that the considered period was characterized by relatively low air temperatures and high precipitation compared with modern conditions. Analysis of the long-term pattern of the mean annual temperature for all three regions reveal two synchronous significant cooling periods observed in 9300-9100 cal. yr. BP and 8500-8100 cal. yr. BP as well as rapid growth of the air temperature in 8100-7800 cal. yr. BP, when the annual temperatures increased by 3°C during about 300 years. The cooling phase of 8500-8100 cal. yr. BP could be corresponded to the distinct "8.2 ka event" widely recorded across Europe. Periods of climate warming are coincided with periods of precipitation rise whereas the cool phases are characterized by its decrease. The ratio of actual evapotranspiration and precipitation amount selected as indicator of surface moistening conditions decreased significantly in period of cooling phases (down to 0.27) and can be used as a clear indicator of ground surface overwatering and strengthening for mire formation processes. This study was supported by the Russian Science Foundation (Grant 14-14-00956).



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**Dynamics, socio-economic and biophysical drivers of land-cover change in the former Virgin Lands Campaign area of Kazakhstan**

Alexander PRISHCHEPOV, Daniel MÜLLER, Brett HANKERSON, Tobias KUEMMERLE, Andrey DARA (Denmark)

We conducted the first detailed assessment of agricultural land-cover change in the northern Kazakh grain region from 1953 to 2015 during Soviet and post-Soviet cropland development using archival land-use maps of Virgin Lands Campaign and multi-temporal 30-meter Landsat TM/ETM+ images. Using spatially-explicit modeling framework we tested about statistically significant association between land-cover change patterns and socio-economic and biophysical characteristics for our study area. Our analysis showed, there was precipitous cropland expansion at the expense of virgin steppes from 1953 till 1961, and later on cropland expansion slowed down by 1990. From 1990 to 2000 we observed massive agricultural land abandonment, especially of expanded croplands from 1961 to 1990, and re-cultivation of abandoned cropland after 2000. Our spatially-explicit econometric models showed, biophysical factors largely determined massive land-cover change such as cropland expansion during the Campaign and further agricultural abandonment after the breakup of the Soviet Union and overrun the proximate socio-economic determinants of land-cover change. New state-driven agricultural program “Kazakhstan-2020” is targeting to increase agricultural production and livestock numbers, also at the expense of abandoned lands. One we projected our modeling results about land-cover change, we came to conclusion, despite of common belief about untapped agricultural potential of abandoned croplands in Kazakhstan our study showed how limited such potential is. If increasing production is a goal, improving crop yields in currently cultivated lands should be a focus, whereas extensive livestock grazing and the preservation of non-provisioning ecosystem services, such as carbon sequestration, and biodiversity should be priority on more marginal lands.



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**Global Carbon Mitigation Cooperation Scheme**

Changxin LIU, Zheng WANG, Yuan TIAN, Rui HUANG (China (Beijing))

This paper proposes a new scheme for global carbon mitigation cooperation. The scheme meets three requirements. Firstly, meet the emission reduction requirements. In specific, global temperature should not exceed 2oC in 2100. Secondly, match the principle of Pareto improvement. Thirdly, keep fairness as much as possible. Based on these requirements, sensitive analysis is given for the important parameter, the discount rate. The scheme is cheese by the integrated assessment model using game theory, MRICES. The results show that the alteration of discount rate will not change the no-cooperation Nash equilibrium but it does affect the Pareto improvement solution.



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**Measuring urban sprawl using Landsat and night-time images: Case Study of Hyderabad, India**

Koel ROYCHOWDHURY (India)

The number and size of urban settlements are increasing in all the continents of the world at a rapid pace. Urban sprawl is associated not only with changes in landcover and area, but also ecological, climate and social transformations. Remote sensing has long been used to map human settlements. This study compares two satellite images: one captured during daytime by Landsat and other captured at night by DMSP - OLS and VIIRS sensors. The changes in the urban footprints of Hyderabad between 2001 and 2014 are mapped and measured in this study. Landsat data is captured during the daytime and gives spectral reflectance values while the DMSP-OLS data captures artificial lights from human settlements at night and produces brightness information. A method of image segmentation is used for the night-time images while classification of the Landsat data of 2001 is based on an object oriented, hierarchical approach. The images of 2014 are classified by a method of supervised classification. The results show an accuracy of more than 90% in the classification and delineation of urban, suburban and rural landcover types. There is an increase of more than 10% in the urban landcover in the last decade. This study shows that, in addition to spectral reflectance captured by satellites during the daytime, differences in the degree of brightness of the lights emitted from urban areas at night is also an effective indicator in delineating landcover types.



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**Geoecological assessment of territories using global and regional databases**

Marina ARSHINOVA, Ali ALYAUTDINOV, Emma ROMANOVA (Russian Federation)

Analysis of geoecological problems and evaluation of geoecological situations at different territorial levels (local, regional, national, macroregional, etc.) is necessary for sustainable nature management and development of territories. The algorithm of geoecological assessment is based on the concept of present-day landscapes as geosystems with interacting natural, economic and social subsystems (Romanova 2010). The procedure of geoecological assessment therefore includes the following stages: identification of natural regions and assessment of their resource potential; analysis of the history of human settlement and economic development of territories; analysis of settlement systems and economic activities, identification of natural-economic regions; identification of geoecological problems, selection of characteristic environmental indicators for each of them; identification of geoecological regions basing on the set and intensity of geoecological problems; integral assessment of geoecological situation within geoecological regions. Each stage of the assessment requires application of numerous qualitative and quantitative indicators from available global and regional databases (Geostat Population Grid, Global Land Cover, Corine 2010, European Pollutant Release and Transfer Register, etc.), national and regional maps and atlases. The main problem to solve is the conversion of data characterizing administrative and economic spatial units into parameters valid for particular natural geosystems. Application of the proposed algorithm and the resulting series of maps are presented for several European countries.



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**Integrated analysis of land cover changes in the forest-steppe region of Russia**

Elizaveta KHAZIEVA (Russian Federation)

Nowadays there are many remote sensing methods and tools, which help to deeply understand the land cover processes on the large area without field researches. The cartographic modeling is one feasible way to analyze and deeply understand the data and processes which take place in the region. Combination of different data (such as remote sensing data, statistical information, historical maps and other), knowledge about the territory ensures integral investigation, better demonstration of the result. Models are useful and used in a vast array of GIS applications, from simple evaluation to the prediction of future landscapes. Cartographic modelling is a general methodology for the analysis and synthesis of geographical data. It employs what amount to an algebra in which single-factor maps are treated as variables that can be flexibly manipulated using an integrated set of functions (Paul et all. Al, 1991). The developed model included variety of nature inputs (like temperature, precipitation, curvature, altitude and etc.), which might be specified for local area according to it's specific characteristics. As a result we can observe that the process of overgrowth is a common for the whole territory. The croplands are changed by wooded grasslands and shrublands, also the grasslands give place to wooded grasslands. The first type of transformation is more related to south areas with higher temperature (spring-summer season), chernozems, and flatter slopes and, in general, the lower altitude. Another one is more typical for north and east-north part of the territory. These areas are characterized by lower temperature (spring-summer season), greyzems and haplic chernozems on the steeper slopes. The developed model included variety of nature inputs (like temperature, precipitation, curvature, altitude and etc.), which might be specified for local area according to it's specific characteristics. Also some socio-economic data sets could be include in this model. Obviously, that will improve the whole process of classes' determination of the area.



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**Landscape analysis of the Crimean Peninsula in the context of climate change and new social challenges**

Vladimir BOKOV, Viktor SMIRNOV (Russian Federation)

Climate change and new social challenges makes the task more efficient use of landscape resources of the Crimean Peninsula. This is possible with a more detailed consideration of the peculiarities of organization of landscape systems. They are polystructure netting statistical objects with limited integrity, variable in space and time. The traditional scheme of landscape zoning, based on the type hierarchy tree, do not represent the fullness of the real connections and interactions of landscape systems. The matrix nature of landscape interactions connected with chain reactions, delay of reactions to influences, existence of information interactions, inter-level interactions, relative character spatial hierarchy of landscape systems is revealed. Landscape systems represent statistical ensembles of conditions in which the important place is taken by a spatial and time noncommutativity of conditions. These emerging integrity have different characteristic times. As a result, each landscape segment is characterized by its set of conditions and situations. This nature of spatial and time interactions creates the preconditions for the growth of natural processes, due to increased external effects as a result of chain reactions in the landscape (floods, landslides, frost, and others). Consideration of these circumstances, allows you to more thoroughly characterize the landscape resources of the region. Estimated transformation processes at the landscape level due to climate change. The change is most clearly manifested in the last 30 years. There was an increase in quantity and intensity of frosts, storm rainfalls, unfavourable geomorphological processes. Knowledge of spatial and time regularities of manifestation of these processes allows to place more rationally agricultural, industrial, transport, recreational and settlement objects. The economy of the Crimea consisted in the conditions of considerable receipts of energy and water from other regions. In new socio-political realities there was an imbalance which can be overcome including the ways connected with landscape approach: 1) more effective use of local power sources and water (for each landscape contour the level of energy efficiency and security with water resources is defined); 2) energy saving due to more effective location of economy across the territory; 3) the accounting of the landscape and ecological limitations connected with a high biological and landscape diversity. The accounting of character of structure of a landscape allowed to develop algorithm of calculation of landscape and geophysical parameters at various spatial levels.



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**Initial Stages Of Socio-Natural History Of Landscapes Of Central Russia**

Kirill GRAVES, V.A. NIZOVTSEV, N.M. ERMAN (Russian Federation)

The first anthropogenic landscape complexes emerged with the transfer from the appropriating type of economy to producing one. In Central Russia such transition, or the Neolithic revolution, dates back not earlier than the Bronze Age. Landscape-transforming anthropogenic influence stemmed from the development of cultivation and grazing, formation of permanent settlements and specific features of their spatial distribution. At the turn of IX-VIII centuries B.C. there was the expansion of the tribes of the Iron Age in Central Russia. Along with cattle breeding the cultivation, both slash-and-burn and field, gained an important role in the economy. In the Iron Age the development of permanent long-term settlement and agricultural structure had led to the formation of true anthropogenic and cultural landscapes. The following stage of socio-natural history is the Slavic colonization of the region (VIII-XII centuries A.D.). At the turn of the I–II millennia Slavs of Central Russia were engaged in agriculture, cattle breeding, hunting, fishery, apiculture and wood processing; they had first crafts already: pottery, blacksmith's work, jewelry and even metallurgy based on local raw materials. Field cultivation has contributed to the move of ancient Russian settlers from river valleys to interfluve's landscapes with more diverse resource base. The prevalence of field cultivation has led to the formation of permanent centers of more profound influence on landscapes. Irreversible impact on soils and lithogenic base of natural territorial complexes was caused by stubbing and development of washout-inwash processes on the slopes. The permanent fields were formed around the settlements which could be considered the arable anthropogenic landscape complexes of that time.



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**Periodization Of Natural And Human Consistent Parts Of Landscape Evolution In The Forest Zone Of The Russian Plain**

Vyacheslav NIZOVTSEV (Russian Federation)

Rhythmic variations in climate had crucial importance in the evolution of the landscapes, leading to repeated shifts of their types (zones). For the territory of Moscow glaciation the distinctive feature is limited diversity of the morphological structure of landscapes as compared to the area of the Valdai glaciation with smaller landscape complexes of the local level. The landscapes of the mixed forests during the Holocene changed their typology four times (taiga - mixed forests - deciduous forests - mixed forests) and changed six subtypes of landscapes. The southern taiga landscapes and northern taiga landscapes changed four types with five to eleven shifts of subtypes of zones, respectively. Starting from the Subboreal period the anthropogenic transformation of landscapes begins, which dramatically increased only in the last 400 years in the area of Moscow glaciation and in the last 300 years in the area of Valdai glaciation. At the zonal-provincial level several basic types of economic development of landscapes have developed which presented spatial pattern of combinations of natural and man-made landscape complexes. The southern and middle taiga landscapes of Valdai glaciation are characterized by small-focal type of economic development due to the fact that small arrays of developed lands are confined to high-drained sites - moraine hills and kame hills or remnants of the "flush moraine relief." There are common linear and threaded subtypes of drawings inherent to valley type of development. The combination of the small-focal and linear subtypes is typical for the areas of terminal moraine ridges. The mosaic type of development with approximately equal mix of forest and treeless territory is more typical for landscapes of mixed forests of the Moscow glaciation.



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**Intralandscape differentiation of land use changes: identification of the causes and the forecast in the example Borovsky District (Russia) in the XVII-XXI centuries**

Daniil KOZLOV, A.I. GLUHOV, A.A. GOLUBINSKIY, D.A. KHITROV (Russian Federation)

In general, the originality of modern landscapes is determined by the combined action of natural, positional, and social factors. Originality of the natural landscape defines its potential production capacity. Positional conditions determine settling characteristics and possibilities of an economic use in relation to the centers of socio-economic activity and infrastructure of a different rank. Social factors determine the specialization and intensity of an economic use that are associated with demographic, political, historical and ethno-cultural characteristics. When the ratio of these factors changes by force of evolutionary processes or external influences, it changes the land use structure. The aim of the research project RFBR # 14-05-00568 is to set patterns of specialization and dynamics of the land use for the last 300 years for the contrasting historical and geographical regions of European Russia (see other abstracts of the current section). The most detailed reconstruction was obtained for key sites located in Borovsky District of Kaluga region. Based on the detailed map reconstructions of resettlement and land use, a quantitative analysis was done of the dependence of economic use on natural, social and positional factors for five terms: 1620-1760-1850-1940-2014 years. After the beginning of XVII century arable area was increased from 30% to 65% by the end of the XVIII century and was reduced again to 20% at the beginning of the XXI century as a result of depopulation and agricultural desolation of Nonchernozemic zone. The invariant area of agricultural and forestry use is determined, as well as the region which economic specialization is subject to change. The resulting regional model allows to predict the structure of land for a specified relation of positional and social factors.



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**Historically-geographical analysis of socially- ecological trends to optimize recreation potential of the territory**

Anastasiya KYZNETSOVA, T.A. BARABOSHKINA (Russian Federation)

On the border of the centuries in the Northern Eurasia simultaneously with the decries of socially-economical development several facts were fixed:1) sustainable trends to the decries of exhausts and emission in various economical spheres; 2) reduction of technogenic pressure on the components of the ecosystem,according to the main resolutions of the OON in 1992.This phenomena let us modernize the diagnostic criteria of the influence of natural geologic factors on the sustainable development of biotic components of the ecosystems in various regions of Eurasia.Obviously these processes were identified in the borders of key-zones of Crimean-Caucasus mountain zone and among the main conditionally-foned regions. For instance the contrast regions of Crimea were analyzed ( seashore zone of Black sea ,The second range of Crimean mountains).Comparing analysis has shown that whole medically-geological specifications are caused by the type of eco-geological systems which depend on the historical development of the territory.On the moment off studying identified factors of the risk were limitations to the choose of type of functional organization of considered territory and the main directions of further development.For the optimization of nature-utilization in explored regions it is urgent to take into the consideration the world experience of utilization of this type of regions.The complex approach lets us not only to solve economical and ecological problems,but to optimize the recreation potential of the territory.The reserch was made with the partial support of the Grant RFBR №15-05-01788 A.



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**Late Holocene environment dynamics and human activity in the forest-steppe zone of European Russia (satellite and pollen-based reconstructions)**

Elena NOVENKO (Russian Federation)

The Holocene vegetation dynamics in the forest steppe zone of European Russia were assessed using analogue-based methods of quantity reconstructions using modern and fossil pollen data and MODIS satellite images. The main steps of our study are (1) creation of the reference dataset consisting of 965 surface pollen spectra and associated satellite (MODIS)-based estimates of woody cover density, (2) checking the accuracy of regional woody cover reconstructions using the "Best Modern Analog" approach applied to the reference modern dataset, and (3) application the method for reconstruction of vegetation disturbance in the key-region, located in the Upper Don River basin in the central part of European Russia. The accuracy of reconstructions was tested by leave-one-out cross-validation. The results of tests was well but imperfect (R2=0.57 and SEE= 10.8%), however it is sufficient for reconstruction of major changes in forest vegetation. The obtained results show that signals of anthropogenic changes in the vegetation in the forest-steppe zone and human-induced fires are clearly pronounced in the Neolithic and Bronze Ages, however human impact on plant cover was not significant until 2400 cal. yr. BP. Reconstructions of total woody cover show a good agreement with land-use history of the territory. An extensive agriculture during the periods of human occupation resulted in decrease in forest coverage, when the territory was abandoned forests recovered their areas. Large-scale landscape changes and the degradation of natural vegetation occurred in the Medieval time and become conspicuous over the last two centuries. This work was supported by RFBR grant 14-05-00550.



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**Landscape dynamics and human impacts in the Late Holocene in the Ladoga basin**

Tatyana SAPELKO, Dmitry GERASIMOV, Tatyana GUSENTSOVA (Russian Federation)

Pollen data that correlated with macrofossil, archeological and other data are permit identify the human impacts and land use in the Late Holocene and in the recent past. We received new data from lakes and archeological sites in the Ladoga Lake basin. We have new pollen data from Karelian Isthmus and Onega-Ladoga Isthmus. A new archeological site Podolje-1 is situated in the southern shore of the Ladoga Lake. Another archeological site Komsomolskoye is situated in northern shore of the Ladoga Lake. In the all sites was indicated pollen of Cerealia and ruderal herbs. The study was supported by the Russian Foundation for Basic Research (N 15-06-05548 and N 13-06-00548)



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**Land use history of the Meschera Lowland (European Russia) in the XVIII-XXI centuries**

Viktor MATASOV (Russian Federation)

The analysis of spatial and temporal dynamics of the land use structure in the Meschera Lowland since the late XVIII century has been realized considering the contribution of natural and positional factors. The "natural" factors refer to the land agricultural suitability characterized by drainage, soil fertility, erosion, etc. The "positional" ones mean distance to rivers, villages, roads. Two key plots, located in the Ryazan region in differing natural conditions were selected for study. The first is located at the junction of two landscapes: a low, largely swamped, with poor sandy substrate and high, better drained, with loamy soils. The second includes elevated eroded karst plateau with loess fertile soils and the valley of the Oka River with sandy terraces and meadows on floodplains. The land use structure was analyzed using the maps created from General Land Survey maps (XVIII), Atlas Mende maps (XIX), satellite imagery Corona (XX) and modern satellite images (XXI). These were matched up in GIS with landscape maps bound to georeferenced topographic maps considering features of the landscape. The impact of natural and positional factors upon the land use structure was estimated using the General Discriminate Analysis. The results obtained suggest that in the regions where economic activity is strongly limited by natural conditions the structure of land use remains practically unchanged for a long time while in the absence of constraints the socio-economic and positional factors play a leading role in the diversification of the land use by creating new activities and leaving only the best land for plowing.



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**Old Russian City And The Landscape**

Irina GRAVES, K.K. GRAVES, V.A. NIZOVTSEV, N.M. ERMAN (Russian Federation)

The landscape analysis of the spatial distribution of historical cities has showed that at an early stage (in the IX-XI cent.) in the Old Russian period the places for the construction of cities (ancient cities - Great Novgorod, Smolensk, Beloozero etc.), as a rule were chosen on the most important waterways taking into account their safety, with a relatively simple landscape structure mainly on downhill surfaces of low floodplain or lacustrine terraces, areas of low valley outwash plains, rarely on valley slopes of interfluvial plains. In the XII century cities began to be established in the river valleys on the steep banks of the relatively isolated areas of valley outwash plains. Suburbs were situated on the lower levels: on the second and the first above flood-plain terrace. As almost all cities were self-reliant on food or formed as centers of surrounding rural areas, when choosing a place of establishment of the city a preference was given to ecotone areas with a complex landscape structure and rich resource base, which allowed the first inhabitants to have a flexible complex economy. In general, lands surrounding the cities as a rule had optimal properties for the tillers of that time. The main limiting factor of the nature use at that time was poor drainage of the land. Based on a detailed analysis of the landscape of Smolensk, Great Novgorod, Totma, Great Ustyug and Solvychegodsk an attempt was made to explain from the landscape position the problem of the transfer of a number of ancient cities.



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**Dynamics and evolution of postmeliorated landscapes: A case study of Meschera lowland**

Tatiana KHARITONOVA, K.N.DIAKONOV (Russian Federation)

Abandonment of large areas of arable lands have taken place in Russia in 90s. Evaluation of ecological and social-economic consequences of land use change became a challenge for landscape research. The study is performed in the terms of relative evaluation of social-economic functions of a landscape in an indigenous state, in a state of intensive agricultural use and in a state of abandonment. Following indicators were used to identify regulating functions: soil moisture, water regime stability, quality of surface water, radiation and heat balance, local and soil climate, balance of soil organic matter. Soil fertility represented supporting functions and was reviewed by C:N and C:H balance, soil acidity and by Ramensky indicator values. Provisioning functions were estimated by annual productivity of grasslands and radial increment of trees. Obtained results are based on material collected at Meschera scientific station during period from 1977 to 2013. Research area is a sedge fen which was drained and cultivated in 1966 and abandoned in 1992. Drained ecosystems decreased their productivity; mineralization of peat entailed organic loss, water pollution and temporary growth of soil fertility; regulated water regime supported new fields for agriculture. In a period of 10-12 years after drainage landscape has adapted to new conditions and improved its functions – biological productivity have risen to referent level, peat mineralization slowed down. Further abandonment haven't stimulated much ecological improvement yet. Clogging of drainage system results in water regime instability which causes instability of biological productivity. Higher water level doesn't support accumulation of a new organic matter but induce soil acidification and fertility loss.



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**Changes in landscape components interrelationships after anthropogenic disturbance**

Ksenia MEREKALOVA (Russian Federation)

The study investigates the changes in adaptation degree of landscape components (vegetation, soils, rocks, landforms) and the hierarchical organization of the landscape (i.e., the degree of subordination of the local geosystems to a higher-order geosystems) during the recovery succession after anthropogenic disturbance. The object of the study is the middle-taiga landscape of European Russia. The main focuses of the assessment are the clusters formed by correlated properties of the landscape components, the strength of inter-components relationships at various stages of the recovery and the stability of relationships at different hierarchical levels. To identify the relations between soil and vegetation properties and the relief of surrounding geosystems the determination coefficients were calculated separately for different-aged forest landscapes after anthropogenic disturbance. In the nonlinear multiple regression models vegetation and soil differentiation factors values (derived by multidimensional scaling) were used as response variables. Morphometric characteristics of landforms for varying environs served as predictors. The results show evidence that relationships between vegetation and the relief characteristics become weaker as phytocenosis recovers after disturbance. Coherent response of vegetation and soil indicators to changes in environmental conditions enabled us to reveal the clusters of interrelated properties of landscape components which are sensitive to 1) humidity, 2) swamping process and 3) nutrients supply. The stability of clusters during the recovery changes for the different stages of succession, but, overall, interdependence of vegetation and soils properties usually increases as natural landscape recovers.



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**Land Degradation and Management in Dhaulpur District, Rajasthan, India**

Rama PRASAD, Rani SINGH (India)

In India vast tracks of lands (20.17% of total geographical area) exists as wastelands. In Thar Desert of region of Rajasthan, in India land degradation is occurring at an increasing rate. Land on India suffers from varying degrees and types of degradation, stemming mainly from unstable use and inappropriate management practice. It manifest chiefly in the form of water erosion followed by wind erosion, bio-physical and chemical deterioration. The present study juxtaposes the view of land degradation with the increase in wasteland in eastern most part of Rajasthan where whole economy is dependent on agriculture. Over 40% area is affected by various categories of wasteland. Gully and ravine erosion is severe problem along the river Chambal (only perennial river in state), which has a calamitous effect on the agro-economical activities of the area. Overgrazing and salinity are other problems causing degradation of land. Prevailing of semi -arid climate, the area is renowned for its badland topography. Objectives are to evaluate the Tehsilwise distribution, trend and characteristics of 10 years interval, to identify the various environmental and anthopogenic factors responsible for land degradation and to assess the pattern and problems at field level by selected sample villages. Analysis reveals that villages located in the ravine area are not connected by roads, making them isolation from other places, which are found favorable for the local inhabitants to involve in crimes. At the end, suggestions are provided for the proper management of land degradation and development and maintenance of the ecological balance.



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**Assessment of land use and landscape dynamics contribution to contaminants migration at the example of 137Cs in Bryansk region (European Russia)**

Kristina NENKO, Vitaly LINNIK, Nadezhda VOLKOVA (Russian Federation)

The vast territory of Russian Federation was contaminated by 137Cs radionuclides due to the Chernobyl disaster in April, 1986. Bryansk region was suffered the most. The study area is situated in the central part of the region. It locates outside the officially established pollution zone (where contamination levels are under 1 Ci/km2). Nevertheless we are interested in its studying because the 137Cs radionuclides serve as a mark for research of substance migration in the landscape. Radioactive contamination within the study area was formed as a result of "dry" deposition from the atmosphere. Consequently, the initial contamination was spread relatively equally. We used the data of air-gamma spectrometry survey, conducted in July, 1993, in 7 years after the accident. It contains the information about the density of the secondary 137Cs contamination in a raster format (100´100 m grid). This pattern is formed by numerous factors. The main factor is the relief of the territory. However land use and seasonal dynamics of landscape structure are also the significant factors. We assesed the contribution of these factors to redistribution and concentration of contaminants under the conditions of so called Opolje and Polesye landscapes. We used the remote sensing data to analyze the land use structure in period from 1986 to 1993 year. Also there was collected data on microrelief and seasonal changes in landscape structure. It made it possible to reveal the spatial patterns of pollutants redistribution and separately evaluate the contribution of landscape structure and land use factors.



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**Mountain landscapes: from traditional presentations to modern problems**

Zulfira GAGAEVA, Umar GAIRABEKOV (Russian Federation)

The problems connected with landscape use and land cover changes conduct the mankind since its purposeful impact to environment. Nowadays the effects of the impact have of acquired global scales. The problems caused by this impact to landscapes, related not only with environment, but also with social and political component. It is well known that mountain ecosystems are an important source of water, energy and biodiversity. These are the largest ecosystems of the planet and play an important role in maintaining of the global ecosystem of the planet. In addition the mountain areas - is the richest recreational resources of the world. The certain part of the world's population is depends on the resources of mountain ecosystems. Therefore the transformation processes that upset the ecological framework of mountain areas are dangerous and destructive. Any intervention to the mountain landscape exceeding the maximum allowable loading cause the appropriating reaction. Landslides, soil degradation, destruction of rare species of plants and animals – it is not a complete list of problems of the modern mountain landscapes. Also it should be noted that the mountains are the birthplaces of many traditional cultures of different nations of the earth. The modern researches have to consider the problem of mountain areas from the system approach. These problems could not be considered separately from the man. Sustainable development of mountain areas represents an extremely important part of the global problem – the problem of human relationships with an environment.



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**Mountain grasslands of the Central Caucasus: land use heritage and contemporary change**

Raisa GRACHEVA, Elena BELONOVSKAYA, Vera VINOGRADOVA, Ilya SHORKUNOV (Russian Federation)

The conventional schemes of the development of spatial distribution of grassland ecosystems in intermontane basins of the Central Caucasus have to be corrected taking into account the history of land use. The historical records say that ecosystems of intermountain basins of North Ossetia have been adapted and used under cropland for more than 3,000 years. Extensive use of mountain slopes up to 2000 – 2100 m a.s.l. under arable land, including terracing, is 6 - 7 centuries after the mass population exodus from the plain caused by the invasion of the Mongols and Timur. 60 – 100 years ago mountain arable lands were turned into pastures and haylands. Recent slope topography reflects the long human impact, and soil memory has records of the kinds and duration of human activity and its interruption. Using multidisciplinary approach our study revealed that a diversity of forest-meadow-steppe and subalpine grasslands of the North Ossetia was developed on the former arable lands over the past 60 – 65 years; the last 20 years lands are underused or abandoned because of sharp livestock decrease. Forty-year grazing contributed to steppification; recent impact weakening causes increasing biodiversity and bioproductivity and convergence of vegetation cover independently of location. Methods of remote sensing and mapping of vegetation indexes (VCI, NDVI, SCEI) show that there is a trend to humidity increase from the beginning of XXI century in the studied altitudinal belts. Thus the vegetation of intermountain basins restores under unidirectional influence of climate and socio-economic changes. Researches were supported by RFFI grant № 14-05 00233A.



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**Succession Changes of CO2 Soil Emissions from post-agrogenic soils: Chernozems as compared to Podzols (European Russia)**

Dmitry LURI, Dmitry KARELIN, Sergei GORYACHKIN, Arseny KUDIKOV, Vsevolod LUNIN (Russian Federation)

The dynamics of carbon pools and CO2 emission from Chernozems (forest-steppe, European Russia) and sandy Podzols (southern taiga) in the course of post-agrogenic successions were compared. We measured total emission from soil surface and, separately, from litter, during warm and winter seasons in abandoned fallows of different age: 0 years (cropland), 7, 23, 55, 100, and 170 years (south taiga, 2010-2011) and 0, 2, 8, 38, 66 (steppe, 2012-2013). Intra-annual changes of emission at different stages of succession are modeled, using soil temperatures and moisture. The regression modeling allows to estimate the annual rate of soil emission at every stage. In both cases the changes in CO2 emission in the course of succession have a similar pattern: the emission sharply increases in the first years, then somewhat decreases, and gradually increases again up to climax state. But the mechanism is different. In both ecosystems, in the course of successions the temperature in upper soil layers decreases due to rise of its insulation resulting from accumulation of litter and organic matter, which leads to decrease of emission at middle stages, when litter storage is not big enough yet. According to our models, the restoration of initial rate of CO2 emission could be completed in 80-100 yr after fallows abandoning in Chernozems, which is significantly faster, than in post-agrogenic Podzols (150-170 yr). Under contemporary warming this is mostly due to zonal differences in litter, organic matter and phytomass storage in upper soil horizons, than to zonal sums of positive degree-days.



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**The agrogene transformation of steppe-forest landscapes of Central Russian Upland**

Daniil KOZLOV, Nikolay LOZBENEV (Russian Federation)

During centuries, Russian chernosems and steppe-forest landscapes are under agrogene pressure. The aim of this research is to provide science-based estimation of their transformation. Two landscapes-analogs in Kurskaya region were taken for this. First of them is an old farmland and the second is virgin steppe. Because of changed vegetation comparison of landscapes can be provided by comparison of soil properties. First of all, the morphological structure of the study regions was described and it was found, that agricultural activity causes its simplification. Basing on standard methods, soil samples were taken for analysis. Bulk density and humus content were identified for them. Then comparison of soil profiles was provided for detection of main factors of humus and bulk density differentiation in soil profile. It was found, that humus content in arable horizon (0-30 cm) decreased to 5-6% in agricultural landscapes in comparison with 10-12% in virgin landscapes. Moreover humus stock decreased from 600-700 t/ga to 400-500 t/ga. Basing on detailed digital elevation model modelling humus stock and soil organic carbon (SOC) stock for two territories-analogs was modeled. Methods of linear regression analyzing and non-linear general classification (regression tree models) were used for it. As a result, we got models of humus and SOC stock for layer 0-100 cm, 0-50 cm and for each 10 cm. Then the comparison of SOC stock in 2 areas was provided for correct explanation of soil and landscape changes under the anthropogenic treat.



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**Carbon stocks and fluxes in the ancient residential areas of the forest zone (European Russia)**

Andrey DOLGIKH, D. KARELIN, A. KUDIKOV, A. MEDVEDEV, A. SMAGIN (Russian Federation)

Comparative studies of soil carbon dioxide emissions were held in natural and anthropogenically transformed landscapes of the southern taiga (Novgorod region.). Measurements of emission by closed chambers method were carried out in the natural spruce forest, arable land, post-agrogenic meadow and forest, residential areas of different ages in Veliky Novgorod. Thick urbosediments (habitation deposits, up to 7m) with high organic carbon content (10-35%) were formed in the historic center due to a long history of development of the Veliky Novgorod since the 10th AD. The values of soil carbon dioxide emissions in the city are depends on the capacity of the transformed urban deposits and its content of organic carbon. Reduction in soil emissions 2.35 times and decreasing carbon stocks were revealed from the historical center to a modern residential areas. The maximum values the of soil carbon dioxide emissions in southern taiga (Novgorod region) are corresponds to ancient residential areas of the city center, the minimum - agricultural arable lands. Hydromorphic organic layers of urbosediments (10-15th AD, raw organic material, organic carbon 25-50%) in the historic center of the ancient cities can be important storages of adsorbed carbon dioxide. The results of field experiments and modeling of pulsed carbon dioxide emissions from hydromorphic organic urbosediments (Veliky Novgorod) were showed that the thick urban habitation deposits are accumulated significant amounts of carbon dioxide at a distance from the soil surface.



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IGU2015 – 1033

**Carbonate pedofeatures in soils of crio-arid landscapes of Altai Mountains as a proxy of paleoenvironment**

Jessica VASIL'CHUK, Pavel KRECHETOV (Russian Federation)

The key-site is situated in the highland basin of the Ak-Khol lake (southeastern Altai Mountains). This area was studied in detail by M.A.Bronnikova with colleagues (Bronnikova et al, 2012, 2014). In order to examine geochemical variations of carbonates in soils of crio-arid landscapes two catenas with the same summit have been studied. Haplic Cambisols Pisocalcic Skeletic present the majority of soils along both catenas, they are characterized by carbonate coatings on the stones within the profile and diffused carbonate material as well. The toeslope that refers to the first catena coincides the floodplain of the freshwater Ak-Khol lake. The lowest member of the second catena is a floodplain of perched brackish water lake, its water contains sodium hydrocarbonates, while the Ak-Khol lake water's composition is calcium hydrocarbonate. These two lakes have different sources that is shown by δ18O values: –15.19‰ (the Ak-Khol lake) and –6.13‰ (perched lake). Fluvisols of Ak-Khol lake floodplain do not contain carbonates, while soils of a perched lake are alkaline (pH = 8.9…10.0). Carbonate coatings consist of 38% of SiO2 and 16% of CaO. The content of carbonates in soils varies from 2% to 8-10%. Total alkalinity value is significally higher than carbonate one everywhere along catenas. Parent material is presented by gneiss and granite. Shorelines of previous Ak-Khol lake levels, surrounding perched lakes, chemical composition of lakes' water and soils as well as distribution of carbonates in the profile show that the presence of carbonates in soils is connected with lake impact in the late Quaternary. Field study was funded by Russian Foundation for Basic Researches (grant № 13-04-01829), analytical work was funded by Russian Science Foundation (grant №14-27-00083).



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**The middle and late Holocene landscape dynamics and land use in the central part of the Meshera Lowland (Russia)**

Elena NOVENKO, I.V. MIRONENKO, D. A. KUPRIYANOV, A.K. BATANOVA (Russian Federation)

The middle and late Holocene dynamics of forest landscapes of part of the Meshera Lowland (The East European Plain, Russia) and the history of its agricultural land-use have been reconstructed on the base of results of modern landscape research and pollen, plant macrofossil, micro-charcoal and radiocarbon data from two sections of peat bogs. The obtained results have shown that the central Meshera Lowland was covered by pine-birch forests in the period 8.0-7.6 cal. kyr. BP. The broad-leaved tree species penetrated to the region at about 7.7-7.5 cal. kyr. BP. The mixture coniferous-broadleaved forests of pine, oak, lime, elm with birch become the dominant component of the plant cover until the 1.5 cal. kyr. BP and were replaced by birch-pine woodlands. Dramatic vegetation changes occurred only in historical time as a result of human activities. According to pollen and micro-charcoal data, one of the main factors of long-period landscape dynamics in the region was recurrent fires, both wild and human-induced. This work was supported by RFBR grant 14-05-00550.



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IGU2015 – 1750

**Acidity and chemical composition of atmospheric precipitation in the region near Moscow State University**

Irina EREMINA (Russian Federation)

Chemical composition of atmospheric precipitation in the region of Moscow State University was analyzed on the basis of environment monitoring of every event of wet-only sample during the period from 1982 up to now. Every year we have got about 100-150 probes of rain and snow. Concentrations of sulfate , hydrocarbonate , chloride , nitrate, calcium , magnesium , sodium , potassium and ammonium as well as pH and specific conductivity were measured. The analysis of the chemical composition of precipitation and its acidity carried out at the Meteorological observatory of Moscow State University demonstrates significant seasonal and interannual variability. The entire more than 30-year period of observations can be divided into 3 parts with different acidity, changing mineralization and different predominant ions. The percentage of acid precipitation with pH < 5 is about 21 % for a year on average. There were no practically samples of acid rain in 1999 – 2004. Before 1999 and the last years we have 25-30% probes of acid rains every year. The volume weighted mean long-term pH is 4.9, and mean value of precipitation mineralization is 17.5 mg/L. Average annual values of precipitation mineralization varied from 11.8 mg/L (2001) to 27.0 mg/L (1991). Mean mineralization was about 20 mg/L till the late 1990s and about 15 mg/l in recent years. At the beginning of our observations (in 80-90s) sulfate-ion was predominant in precipitation samples. The content of hydrocarbonate ions increased during the period of the absence of acid precipitation (1999–2004), and the concentration of chlorides started increasing considerably since 2005. Under investigation of seasonal snow pack samples we have found that samples of snow pack gathered in the center of Moscow were 3 times more contaminated than in the sub Moscow area samples and 5 times more dirty than snow pack probes in meteorological observatory of the Moscow State University.



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**The Late Khvalynian specific deposition of the Ergeni bench of the Kalmykia**

Radik MAKSHAEV, A.A. SVITOCH, G.V. OSCHEPKOV, D.S. KHOMCHENKO, E.N. BADYOKOVA, T.A. YANINA
(Russian Federation)

Intoduction The Ergeni Upland lies in north-west Caspian Lowland. This area divide the Volga River and the Don River basins. During Khvalynian period Ergeni bench was modified by transgression and regression. The structure and development history of Khvalynian period of the Ergeni bench have been sporadically known in the north part and most studies have been investigated in south part. This region is the classical area of the maximum Early Khvalynian transression that deposited marine sediments containing species facies chocolate clays and fauna. Methods The investigated area includes Gryaznaya, Yalmata and Arshan'-Zelmen river valleys. Generally, the thickness of Khvalynian sediments is about 6–8 m, but a thickness of about 10–20 m may be found in topographic pre-Khvalynian depressions different in origin, outlines, and size (Britsyna, 1954, Moskvitin 1962). Field study included comprehensive investigations of the Khvalynian sections. The range of applied methods included: geomorphological, lithologic-facies and malacological analyses. The altitudes were measured by GPS. Khvalynian sedimets were sampled from outcrop wall in Gryaznaya (~ 28 m a.s.l., 47°56′45.70″N, 44°37′04.71″E), in Yalmata (~ 34 m a.s.l., 47°52′34.66″N, 44°36′48.97″E), in Arshan'-Zelmen (~32 m a.s.l., 47°35′47.01″N, 44°36′00.60″E) and quarry near Tundutovo (~32 m a.s.l., 47°56′59.54″N, 44°37′25.36″E). For local correlation, Early Khvalynian sediments of Tundutovo section along with their content of chocolate clays and mollusc fauna have been used as a stratigraphic marker. First Results Four sections and their sedimentary environment have been described. Lower Khvalynian layers are found at hypsometric levels of 18 to 30 m. Sea level not to exceed to 36 m because of absence higher marine terraces. During the Early Khvalynian, this region characterized quiet depositional environment. The Khvalynian deposits in the Tundutovo, Yalmata valleys are dominated by the chocolate clays that occur usually at the center of the sequence. Chocolate clays include sand and silt interbeds with shells of index species Didacna protracta. References Britsyna, I.P. 1954. Distribution of the Khvalynian chocolate clays and problems of the paleogeography of the North Caspian region. Proceedings of the Institute of Geography, Academy of Sciences of the USSR. V. 62. P. 5–27. (In Russian). Moskvitin, A.I. 1962. Pleistocene of the Lower Volga region. Transactions of the Geological Institute, the USSR Academy of Sciences. V. 64. 264 p. (In Russian).

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**Postglacial to Holocene environmental transformation of the Laptev Sea continental margin**

Ekaterina TALDENKOVA, H.A. BAUCH S. , NIKOLAEV, A. STEPANOVA, N. CHISTYAKOVA, Ya. OVSEPYAN, R.F. SPIELHAGEN (Russian Federation)

The postglacial and Holocene history of environmental changes in the Laptev Sea since c. 17.6 ka is reconstructed on the basis of continuous records of ice-rafted debris (IRD) and Atlantic water indicative microfossils from AMS14C dated sediment cores from the continental slope and outer shelf. Since seasonal sea ice cover is a permanent feature in this high Arctic region the prominent IRD rich intervals in the oldest (>15.4 ka) and youngest (<7.2 ka) sediment units are attributed to iceberg-rafting. The oldest IRD peaks provide evidence for iceberg production by the local ice caps on Severnaya Zemlya. Subsequent meltwater influence is tentatively related to the freshwater release from a retreating Barents-Kara ice sheet. Atlantic-derived waters (ADW) were constantly present at the Laptev Sea continental slope. Comparison between the Laptev Sea and northern Svalbard shelf allows assuming an unmodified subsurface inflow of ADW within its northern branch between 15.4-13.2 ka, which was strongest after 14.7 ka and in line with the overall climate amelioration. A local freshwater event at 13 ka followed by shelf flooding and the establishment of a freshened shelf water mass resulted in an off-shelf displacement of ADW. After 7 ka climate cooling and enhanced Atlantic-derived water inflow caused re-growth of ice caps on Severnaya Zemlya leading to a recurrence of IRD. Peaks of this renewed IRD input are centered at 7.2, 6.4, 5.4, 3, and 2 ka, implying that this millennial-scale variability in the IRD input might be related to an overregional changes in atmospheric circulation patterns.



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**Landscape Reconstruction and Human Spatial Organization During Late Holocene in Peripheral Depression of São Paulo State - Brazil, Through Optically Stimulated Luminescence (OSL)**

Danilo PICCOLI NETO, Archimedes Perez FILHO (Brazil)

The research aims to understand the relationship between human groups and landscape evolution through the techniques of Optically Stimulated Luminescence (OSL) datation in soil source material with different climatic oscillations and archaeological artifacts (such as ceramics) in Holocene, allowing simulations and reconstitution of preterits scenarios. The use of OSL explores the physical properties of luminescence inherent in crystalline solids (minerals) found in the deposit itself, primarily quartz and feldspar, being an absolute dating method of depositional events. Its time span is from about 50 years to about 1 MA, depending on the analyzed material saturation levels, allowing the dating of depositional events throughout the Quaternary, from regional climate events of great magnitude (changes in regional atmospheric circulation patterns) and tectonic events that affected the drainage network (inversions and catches, by the uplift of the headwaters). Thus it is possible the reconstruction of paleoenvironmental scenarios in Peripheral Depression of São Paulo State and generation of new models that simulate the development of climate, vegetation, erosion process and human action of the hunters and gatherers groups, yours spatiality in the territory and its relationship with the environment allowing to trace relationships between the genesis of such forms, and possible past environmental conditions, probably in periods of semi-arid and the subsequent carving of the river channel in hot and humid conditions during the late Holocene.



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**Water budget and connection of the Caspian and Black seas during the Late Glacial**

Olga BORISOVA, Aleksey SIDORCHUK, Andrei PANIN (Russian Federation)

According to the geological data, the Caspian Sea raised at the beginning of the Late Glacial up to +50 m. This level was controlled by the altitude of the sill in the Manych Strait composed of erodible deposits. When the water from the Caspian Sea began to flow through the Manych Strait to the Black Sea, this sill was eroded to the altitude +22 m. The level of the Caspian Sea dropped and the sea volume decreased from 132 to 109 thou. km3. The duration of the level drop was controlled by full-capacity discharge in the strait about 50-60 thou. m3 s–1. It lasted for only 20-30 years. After this event the connection between the seas was possible only when the volume of the Caspian Sea exceeded 109 thou. km3. Water budget calculations for the Late Glacial (Sidorchuk et al., 2009) showed that after about 18 kyr B.P. there could be two main phases of such connection. The first phase was during about 2000 years following the sill destruction at the period of high water flow from the Volga River basin with the maximum annual flow volume from Caspian to the Black Sea about 80 km3. The second one was at the transition from the Oldest Dryas to Bølling with the maximum annual flow volume up to 120 km3. At the both periods the connection was intermittent due to unstable water budget of the Caspian Sea.



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**Reconstruction of the Holocene vegetation dynamics of the Sea of Azov Region (Russia)**

Kristina DYUZHOVA (Russian Federation)

Vegetation changes in the Holocene of the Sea of Azov region have been reconstructed on the base of high resolution pollen records from cores of the Sea of Azov. According to radiocarbon data have been studied marine sediments were formed during the last 6000 cal years BP. The upper horizons of the investigated deposits are characterized by extremely high sedimentation rate that allowed us to discuss vegetation dynamics during the last millennia with decadal resolution. Pollen assemblages of marine sediments are marked by relatively high herbaceous pollen content (the mean value 80% from AP+NAP). This group is dominated by Chenopodiaceae, Artemisia and Poaceae; pollen of the typical steppe plants (Ephedra, Plumbaginaceae, Dipsacaceae) is a permanent components of the spectra. During the late 6000 cal years BP some dynamics in plant cover have been identified. Pollen assemblages of the intervals 5700-6000, 4000-4500, 2300-3000, 1700-2000 and 150-600 cal years BP are characterized by significant growth of tree pollen values (up to 60%) mainly due to Alnus and Betula. Pollen of broad-leaved species (Quercus, Tilia, Corylus, Carpinus) become frequent. Probably, these changes of pollen composition were caused by increasing of forest area in river valleys under more humid climatic conditions. Vegetation development of the Sea of Azov region in the late Holocene was strongly influenced by human impact, especially during the last 100 years.



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**The Dynamics of Development of Watershed Mires on the Middle-Russian Upland (Russia)**

Elena VOLKOVA (Russian Federation)

The mires are rare ecosystems of the Middle-Russian Upland. A lot of mires was formed in floodplains. On the watersheds the mires are formed in the depressions of karst origin. Such depressions have small areas (0,05 - 1 ha). They are different by depth, underlying rocks and volume of water inside. These parameters effect on the features of mire development. The process of mire formation on the Middle-Russian Upland occurred in 2 stages. First stage was begun 6-8 thousands years ago in Oka part of Upland on the old river sands. The development of mires was slow (peat accumulation was 0,56 mm per year) and was accompanied by a gradual change from euthrophic to oligothrophic communities. Second stage of mire formation in karst depressions was begun 2 thousands years ago. The development of mires was fast in very wet conditions (peat accumulation was 3-5 mm per year). During the process of mire formation the euthrophic communities were dominated. The peat deposits of such mires are represented by float which is a substrate for the vegetation. The floating vegetation uses the atmospheric waters and quickly changes from euthrophic to mesothrophic communities. Thus, the watershed mires of the Middle-Russian Upland differ by "age", speed of development, hydrological regime and spectrum of paleocommunities. As a result, the karst mires are characterized by different structures of peat deposits and modern vegetation.



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**Organization of the Biosphere**

Sergey GORSHKOV (Russian Federation)

The organic life role in the global dynamics was perceived and presented in publications by J.B. Lamarck, G. Couvier, Ch. Lyael. J. Reclus, F. Richthofen, G. Marsh, V.V. Dokuchaev, E. Suess, et al. V.I. Vernadsky for the first time proved that the continental crust have the biogenic-geodynamic origin. In Archean era and Earlier-Middle Proterozoic term, i.e. since 3,8 till 0,67 billions years ago, the oceans were muddy and cold. Then phenomenon of a bio-filtration of sea water was absent. In the Later Proterozoic and part of the Earlier Palaeozoic, i.e. during approximately 100 millions years, the bio-filtration had appeared and expanded. The oceanic water had become more transparent. Oceanic surface albedo had lowered down and solar radiation absorbtion had become much higher. It was the time of the Great Skeleton Revolution and transformation of oceans into the major heat machine of the Earth (Barskov, 2010). According to A.P. Lisitcin a maximal concentration of productive phytoplankton and zooplankton-biofilter takes place in the peri-continental zone of oceans. This is a response to the biggest nutrient flows from the land to these zones thanks to river runoff mainly. It is a major signal of interconnections between the land and oceanic ecosystems (according to J. Tricart and A. Cailleux these belong to ecosystems of the densely biosphere). Precipitation is a feedback, i.e. a heat-moisture flow from oceans to the land, predominantly to the river basins. Our civilization is obliged to protect these interconnections but in reality anthropogenic destabilization is in progress.



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**Fluvial system response to proglacial crustal deformations at the SE periphery of the Scandinavian Ice Sheet (SIS)**

Andrei PANIN, D.BARANOV (Russian Federation)

It has long been recognized that horizontal mass transfer in the low viscosity asthenosphere due to glacial loading would have induced uplift and the formation of a peripheral bulge with its axis parallel to the ice sheet boundary. Estimates of forebulge axis elevation (relative to geoid) at the south-eastern margin of the SIS range between 60 m and 170 m. Crustal unloading due to ice sheet retreat was accompanied by forebulge subsidence. The influence of proglacial crustal movements on fluvial systems at the periphery of the SIS has been paid undeservedly low attention in quaternary geology and geomorphology studies as well as in evaluation of landscape transformation dynamics in terms of its influence on human occupation. In this paper we illustrate geomorphicand palaeohydrological effects of peripheral bulge formation and decay by a number of examples from the Upper Dnieper and Upper Volga valleys, particularly sudh effects as river damming by the forebulge and erosion/aggradation successions associated with forebulge migration in response to a retreating ice margin during deglaciation. Further studies are conducted with financial support form the Russian Foundation for Basic Research (RFFI), Project No.15-05-05284.



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**Landscape preconditions for human settlement in Altai Mountains and Tuva region during the late Holocene**

Anastasia GLEBOVA (Russian Federation)

Landscape factors with the dominant geomorphological, hydrological and the vegetation characteristics played the leading role in the distribution of cultures on the territory of Altai Mountains and Tuva region during the late Holocene. Preserved archaeological sites provide us insights into human settlement over the landscapes in ancient times. For this purpose the landscape-archaeological GIS was composed in Mapinfo 12.0 format and distribution of the archaeological sites on the landscape was analyzed with relation to the climatic conditions changes in the mountains. The process of human settlement over the landscapes of the Altai Mountains and Tuva region was not constitutive in time and space but had periods of regression related to the changes in climatic conditions and military-political factors. Based on the analysis of the archaeological sites placement we can conclude that at any time the steppe, forest-steppe and mountain-valley landscapes were in use by people. This can be explained by human economic activities: the main sector of the economy was semi-nomadic and later nomadic herding. Comparison of climatic periods and stages of human exploration of the natural landscapes shows that the most active exploration of the landscapes accounts for the periods of climate humidification. During climate aridization pastures were getting scanty and less productive. Therefore, the inhabitants were forced to use other landscapes, including alpine one for livestock grazing. This led to mobility of human population. Hun-Sarmatian and Old Kyrgyz periods and Tartar-Mongol domination correlate with the arid phases of the Late Holocene. During more humid periods (Scythian, Turkic, and Uighur) good pastures were formed in kettle depressions. Gradually the number of livestock was increased subsequently leading to the partial degradation of the steppe and forest-steppe landscapes. Starting from Hun-Sarmatian period the role of the military-political factor is increased. The results of historical and landscape analysis allow us to make conclusions concerning landscape preferences of the cultures which used to inhabit the Tuva region and Altai Mountains, as well as to trace the general regularities in change of the landscapes during the late Holocene. The study was supported by the RFBR, projects 13-05-00851; 14-05-00650.

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**Altered water and heat budget due to Karst Rocky Desertification in southwest China can influence regional climate**

Jiangbo GAO, Shaohong WU, Yongkang XUE (China)

The possible East Asian climatic effects of altered surface water and energy budget due to Karst Rocky Desertification (KRD) in southwest of China, were investigated in this study. The results about the altered surface water and energy budget indicated that land degradation led to the reduced net radiation by inducing more upward shortwave and longwave radiation, which were associated with increasing surface albedo and temperature, respectively. The KRD also resulted in changed surface energy partitioning into sensible and latent heat fluxes. The latent heat flux at land surface was reduced substantially due to the higher surface albedo and stomatal resistance, the lower Leaf Area Index (LAI) and roughness length in the degradation experiment, while the sensible heat flux increased, mainly because of the higher surface temperature. Compared with the reduced evaporation, the decrease in moisture flux convergence contributed much less to the reduced precipitation. On the other hand, after land degradation in GKP, the southwest monsoon flow from the Bay of Bengal was weakened over the adjacent area to the northeast, influencing the East Asian summer monsoon. Meanwhile, the weaker low-layer anti-cyclone and the stronger horizontal convergence enhanced the vertical motion in the southeastern coastal areas. Furthermore, owing to the decreased surface heating in the degradation experiment, the lifting over GKP and neighboring regions to the east was limited, which resulted in the reduced rainfall within GKP and strengthened the ascending motion downstream over 114°-122°E. Such circulation differences favored the increase in moisture flux and clouds, and thereby caused more precipitation in the southeast coastal areas of China.



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**Drought and grain crop yields in the East European Plain under influence of quasi-biennial oscillation of global atmospheric processes**

Elena CHERENKOVA, Alexander N. ZOLOTOKRYLIN, Mikhail BARDIN, Inna SEMENOVA (Russian Federation)

Monthly precipitation and the 3-month Standardized Precipitation Index (SPI) were used to reveal the patterns of rainfall and severe drought frequency over the East European Plain in the period 1953-2011 in the opposite phases of the quasi-biennial oscillation (QBO). Significant QBO signal was detected in precipitation, atmospheric drought and crop yield in May and in June in the south of the East European plain. Differences of precipitation and severe drought frequency in May and in June in the QBO phases are explained by circulation variations in the westward and eastward phases of the QBO. The analysis indicates less frequent severe drought events over Ukraine and at the center of the European part of Russia in May in the westward QBO phase due to the intensification of the storm track over the East European Plain. The weather conditions in May and in June in the years of the westward QBO phase were more favorable for the yield. The difference of spring wheat yield in the westward and eastward QBO phase exceeds the same difference of winter wheat yield in the Central Black Earth region and in the south regions. Higher difference for spring wheat yield was associated with its sensitivity to the rainfall deficiency and to droughts during the active growing season. It is shown that Ukraine and the region to the east of the Sea of Azov are the most vulnerable areas of increased risk of severe drought during the active growing season at the end of the 20th - beginning of the 21st century.



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**Impact of agroclimatic conditions on winter rye yields in the Central Nonblack Soil Zone**

O.E. SUKHOVEEVA (Russian Federation)

Global warming is a very vital problem today since agroproduction and crops yields depend greatly on climatic conditions. Recent climate changes have become noticeable through transformation of crop vegetation period conditions. The aim is to estimate the impact of changing agroclimatic conditions on the winter rye yields in the Central Nonblack Soil Zone. Materials of the investigation: longstanding data of 20 meteorological observatories, data of Federal State Statistics Service and Long-Term Field Experiment MTAA on winter rye yields. In accordance with the data obtained, temperature factor influences the winter rye yields the most (R = 0,37…0,52, maximum in August – December). The influence of moisture regime is rarely marked (R = –0,37…–0,47). So, in the Central Nonblack Soil Zone the temperature factor has the greatest impact on yields, whereas moisture regime is the secondary factor. We managed to receive the accurate descriptive equations of dependence of winter rye yields from agroclimatic conditions in Smolensk, Tver, Ryazan and Kaluga regions. Yield dynamics is affected by the combination of crop management and weather conditions. According to results of trend analysis in Long-Term Field Experiment for the last 30 years in comparison with XX c. there was increase of the average winter rye yields and its dispersion from 24,2 to 60,0 (dt/ha)2. Its dependence from weather conditions increased from 53,4% to 96%. In the Central Nonblack Soil Zone during the last 30 years there are 21,9 (dt/ha)2 and 56,0 % respectively. The amplification of anthropogenic impact on winter rye phitocenosis is the cause of significant reduction of important agrometeorological factors and dependence on weather conditions. There is potential for crops yields increase by lessening of meteorological factors negative effects and proper using of heat and moisture recourses.



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**Dimensions of Climate Change and Its Impact on Land and Society in Indian Western Himalayas**

Virender Singh NEGI (India)

The Himalayas feature a fragile ecosystem and are vulnerable to both natural processes and man-made ones. The population, settlement and economic patterns within Himalayas have been greatly influenced by the variations in topography and climate. As scientific consensus grows that significant climate change, in particular increased temperature and precipitation, some more changes in the patterns of distributions are inevitable. Change in environmental conditions induced by climate change is expected to transform distribution of terrestrial vegetation. Based on the fact that that flora in any location is predetermined by certain parameters of climate, and that change in these parameters will produce instant changes in plants composition. As the fragile ecosystems of the Himalayas warm up, vegetation and wildlife will move to higher altitudes. Rapid climate change will not give plants and animals enough time to adapt. Biodiversity loss will also affect the health, wellbeing and livelihoods of people. This will further have an impact on the vegetation cover, agricultural patterns, livelihood and lifestyles of the several hundred million people living in the Himalayas and the adjacent vast lowlands. Human versus naturally induced trends in climate change phenomena are debatable, but the micro level factors needs to be given attention to reveals variety of facts determining the process of change. By aiming how vulnerability to climate change depends not only on natural factors, but also on economic, social, and cultural factors which impact on people's status, behavior, relationships, and power, present paper investigates factors that have brought about physical and socio-economic changes in various parts of Indian region of Himalayas, interlinked with the fragile Himalayan environment by mapping, monitoring and change analysis with the help of remote sensing and GIS.



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**Water demand for the main agricultural crops under climate change impacts in the Oltenia Plain (Romania)**

Bianca MITRICĂ, Dragotă CARMEN-SOFIA, Ines GRIGORESCU, Monica DUMITRAŞCU, Elena MATEESCU (Romania)

The climate change effects projected for the upcoming decades (e.g. shifts in the intensity and occurrence of rainfall and temperature, droughts, floods, changes in the crop-growing seasons) may generate a wide range of consequences related to decrease in agricultural productivity, due primarily to water shortage. The study-area, overlaps large arable areas (over 90% of the overall surface) being one of the most vulnerable areas in terms of climate change-related impacts (e.g. intense drought, water scarcity, crop shrinkage), thus agriculture is expected to be one of the main water consumers. Moreover, the lack of irrigations, most of them being destroyed or left in an advanced state of degradation, is likely to intensify the drought effects. The paper is aiming to assess the climate change impacts and water demand for the main agricultural crops in Oltenia Plain using CERES model (Crop-Environment Resource Synthesis) under future climate change scenarios. This model combines climate, soil and crop data with simulation algorithms of the main processes related to crop pattern and statistical algorithms for biophysical, economic and strategic analysis. Two applications of CERES model were used: CERES-Wheat and CERES-Maize covering two regional climatic scenarios for 2021-2050 and 2071-2100 periods. These models describe, based on daily data, the basic biophysical processes taking place at the soil-plant-atmosphere interface as a response to the variability of different processes (e.g. photosynthesis, specific phenological phases, evapotranspiration, water dynamics in soil). The current study was undertaken in the framework of the South East European Programme (SEE) on "Climate Change and Impacts on Water Supply" (CC-WaterS), 2009-2012.



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**Modelling the land-use change effect on local climate in Upper Volga area with COSMO_CLM regional model**

Pavel KONSTANTINOV, Mikhail VARENTSOV (Russian Federation)

Main idea of this study is assessing the influence of deforestation and land-use changes on regional climate of the Upper Volga area under present and future climatic conditions in the middle of XXI century. The best modern instrument for this purpose is regional climate modelling, using mesoscale regional climate models. We chose COSMO_CLM model - Community-Model of the German climate research. Firstly, COSMO_CLM validation for modern climate conditions showed the perspectives for this kind of research. In frame of project, we performed two types of model experiments: with real land-use conditions (I) and with land-use conditions of deforestation (II). Mean monthly temperatures and precipitation patterns has changed, especially its spatial distribution in Upper Volga region. Also possible changes of forest species composition of the Upper Volga area in future and assessment of possible impacts of changes of forest species composition on regional climate at the end of the 21 century was briefly evaluated. The reported study was fully supported by RSCF research project No. 14-14-00956



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**Temperature regime of soils as a factor of ecosystems' functioning (on the example of the East European Plain)**

Olga CHERNITSOVA, Pavel KRECHETOV (Russian Federation)

The study is aimed at the ecological analysis of the temperature regimes of soils of the East European Plain (within the borders of the Russian Federation). Methods of GIS-analysis and geostatistics were applied for revealing the relationships between the temperature regimes of soils and vegetation boundaries. The results of this analysis, as well as the summary of published data on the effect of soil temperature on plants' root systems, biological and biochemical processes in soils, formed the basis for determining the criteria for the assessment of environmental conditions for vegetation growth considering the soils' temperature. Seasonal distribution of temperatures in the soil cover of the East European Plain at different depths (20 to 320 cm), as well as the particularities of soils' intraprofile temperature regimes in different ecosystems were analyzed. The authors proposed the new classification of temperature regimes of the East European Plant soils that took into account the ratio of the environmentally sufficient (5-10°C) and environmentally active (>10°C) temperatures at different depths during the vegetation period, the depth of penetration of active temperatures, as well as the number of climatic averages that characterize environmental conditions for ecosystems' functioning. Zoning of the East European Plain (within the borders of the Russian Federation) on environmental pedo-thermal conditions has been performed.



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**Influence of forest fires in Russia on the gas composition of the atmosphere**

S.N.ZHARINOV (Russian Federation)

Forest fires providing a negative impact not only the on the health and tangible welfare man, also are additional source of emission of greenhouse gases and aerosols. In addition, related to the forest fires emissions of aerosols in the atmosphere may have significant influence on the microphysical and optical characteristics of the cloud cover and hence the climate. Studies show that the content in the atmosphere 30% of tropospheric ozone, carbon monoxide and of carbon dioxide caused by the contribution of forest fires. Annually forest fires distribute smoke on large spaces, changing the composition of the atmosphere. Big forest fires are associated not only with a high level of carbon dioxide (CO2) in the atmosphere, but also have an impact on runoff atmospheric CO2. Both the first and second leads to increase of its content in the atmosphere. The aim of research is to examine the contribution of contemporary of forest fires in Russia in the gas composition of the atmosphere. To do this, the following tasks: define initial data for the calculation of air emissions arising as a result of forest fires, to spend their calculation, perform analysis of the findings. The obtained results allow us to conclude that annually as a result of forest fires in Russia in environmental impact receives more than of 5 million tons of pollutants. The main component that is released during forest fires is carbon monoxide (CO), his contribution is about 40% of total emissions. Carbonic gas is 30%, the methane (CH4) - 20%. Obtained results of calculations talk about the need to strengthen systems forest fire protection, because modern the dynamics of forest fires in Russia shows steady growth, causing an increase in annual volume of combustion products into the atmosphere.



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**Degradation of arid landscapes of Azerbaijan under anthropogenous pressure**

Elbrus ALIZADE, I.Ya KUCHINSKAYA., S.Yu. GULIYEVA (Azerbaijan)

Territory of Azerbaijan, especially its arid and semiarid low mountain - foothill regions making about 60 % of a total area, under the influence of natural and anthropogenous factors are exposed to more intensive development of process of desertification in comparison with other South Caucasian states. On extensive areas arid and semiarid landscapes get new qualities from constant anthropogenous influence, various updatings of an anthropogenous origin are formed. In connection with their unsystematic use active exogenic processes become more, degradation of unstable mountain and foothill geosystems increases, natural balance is broken, there is destruction of natural vegetation, pasture cattle on poorly productive pastures, an infringement of hydrological systems, impoverishment of underground waters, the big concentration of cattle on pastures to a small stock of a forage, repeated засоление soils in connection with without drainage system. Ability of geosystems to self-regulation is broken, productivity of geocomplexes sharply falls and there are potential centers of development of processes of desertification on extensive areas as a result of these events. For the purpose of revealing of the general condition of modern landscape geocomplexes and degree of their susceptibility to process of desertification arid and semiarid landscape complexes are analyzed by us, it is given an expert estimation of their susceptibility to these processes, large-scale mapping of territory on desertification degree is spent: are allocated practically no desertification, low desertification, middle desertification and high desertification complexes. Areas with low degree of desertification towards increase in areas with strong and average degrees of desertification are observed. For more exact diagnostics of processes of desertification detailed research of material structure of landscapes, including is necessary also for migration of chemical elements.



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**Aerial Photographs of mainland taken by U-2 planes: Its characteristics and interpretation**

**Renya SATO, Kunitada NARUMI, Shigeru KOBAYASHI (Japan)**

This presentation reports on aerial photos of mainland China by the Lockheed U-2 spy planes taken mainly in 1950s and 1960s and now archived in NARA II (the US National Archives and Records Administration II, Washington DC.), on which the authors have been investigating since 2013. As usage of geographic data such as topographical maps and aerial photos is strictly restricted in mainland China, high-resolution U2 photos are highly valuable data for investigation of land cover and land use in the mid-20th century mainland China. Authors show full-scale examples of U2 photos taken in Loess Plateau (Shanxi Province) with description on features of cameras and films, as well as examples of its interpretation. Authors also try to trace land cover and land use change by comparison between U2 photos taken in 1960s and high-resolution remote sensing data taken in 2000s. Land cover and land use in Loess Plateau have dramatically changed by terracing and check dam construction in 1960s and 1970s, and by giving up of cultivation with the "Grain for Green" project in 2000s, but detailed change has been hardly traced and evaluated yet. In this presentation, we will discuss the future possibility of the usage of U2 photos for studies of environmental change in China.



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## The reconstruction of historical landscapes of northern forest-steppe in the valley of the Upper Don

Evgenia GORSKAYA, Alexander ALEKSANDROVSKY, Maya GLASKO (Russian Federation)

The knowing of history of relations between human and environmental is nessesary for understanding of modern landscapes. The influence of previous stages of landscapes development can be traced in structure of floodplain geosystems. According to historical and archaeological data the territory of the basin of the Upper Don had several stages of development in the last Millennium. The particular interest is the period of the XVI-XVII centuries. It is transitional time from a long historical period (since the Neolithic till the late Middle Ages) to the modern period. The development of geosystems took place in the period of the climatic fluctuations of the little ice age. Soil-geomorphic studies of the Don valley showed that the formation of relief of the floodplain begun at first half of the Holocene. In the second half of the Holocene the floodplain existed as the terraces. The environmental conditions were favorable for human. As a result, the Bronze Age settlements of XII-XIII and XVI-XVII centuries were found here. The function of these settlements made influence on the transformation of vegetation and soil cover, erosion processes, the formation of deposits of diluvium near base of slopes and alluvium along the river. In modern time, the floodplains are characterized by anthropogenic grasslands on soils of forest and steppe origin, which were formed in the late Holocene. The meadow soils and peatlands are typical for depressions. On the surface of the terraces and gentle slopes of floodplains are dominated arable fields on chernozems and gray forest soils.



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**Soil pH hyper-spectral inversion of oases in arid areas**

Hei-gang XIONG, Kai-long WANG1, Fang ZHANG (China)

Abstract: Based on soil pH data, measured VIS-NIR reflectance and the data pretreated by multiplicative scatter correction( MSC) at the given spots, soil pH prediction models were established by using principle components analysis-PCA, partial least squares regression -PLSR and back propagation -BP. The results showed that soil pH had a good correlation with both the original reflectance and the spectral data pretreated by MSC. The correction between the soil pH and the spectral data pretreated by MSC was more obvious. PCA and PLSR soil pH prediction models both have good predictability on soil alkalinization. BP neural network model had a lower forecasting precision because of the amount of input variables. However, using the principal components obtained from PCA and PLSR models as input variables, the predictability and the stability of the BP neural network model can be significantly improved. Compared with PLSR, BP and PCA, the prediction results of PLSR-BP model is the best.



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**Land use dynamics in the southern part of Valdai hills in the XVIII – XX centuries**

Pavel SHILOV (Russian Federation)

The goal of this research is the analysis of land use dynamics in the southern part of the Valdai hills since the XVIII century. For the detail reconstruction of land use dynamics a key plot was selected with an area of 1400 km2 including the Central Forest State Natural Reserve and its surrounding area of environmental management. The following characteristics of environmental conditions were used: 1.) the percentage of soil with high wetness that limits the possibility of agriculture; 2.) morphometric parameters of the territory estimated by digital elevation model with resolution of 30 m. As positional factors the distance to village, road and rivers were considered. Land use structure was characterized by three different temporal data sources: 1.) General Land Survey maps (the end of the 18th century); 2.) CORONA satellite imagery (the middle of the 20th century); 3.) RapidEye and Landsat imageries (the beginning of the 21th century). Historical maps and remote sensing data were aggregated in GIS and georeferenced to the distinctive features of landscapes. The influence of natural and positional factors on dynamics of the land use structure was estimated using the General Discriminate Analysis. The obtained results show that the structure of human activities is determined by natural and positional factors. According to our data, the structure of land use weakly changed through three centuries strong limiting by natural conditions (e.g. high soil wetness). However, this conclusion needs to be verified with additional historical maps socio-economic data. This work was supported by the RFBR project 14-05-00568.



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**Landscape Dynamic Mapping of The Lesunovo station (The Meshchera Region**

*Iya MIRONENKO (Russian Federation)*

Several approaches are used to display landscape changes: mapping (1) changes in boundaries of economic lands; (2) changes in particular parameters (based on landscapes); (3) a series of landscape maps for different periods; (4) possible or actual processes; (5) evolutionary dynamic series. Each geosystem (GS) changes in time. Stable features of a GS characterize its invariant and rapidly changing features characterize its geosystem condition (GS). Therefore, it is expedient to display dynamics through a series of maps of landscape conditions. At the Lesunovo landscape station (Meshchera), the technique for landscape dynamic mapping was developed and detailed landscape map was produced, with elementary GSs (facies) and their anthropogenic modifications. Landscape dynamic maps can be produced for GSs of different dimensionality or different time sections. We have shown that (1) conditions depend on current and previous weather conditions and on GS properties; (2) facies of one species are identical in condition if anthropogenic effect is identical; (3) GCs of higher ranks are formed by combinations of facies conditions; stows have 1-3 (rarely 5) different conditions; districts, 2-7; and landscapes, 3-6; (4) a simpler spatial structure of GCs usually occurs in the case of long-term types of weather; (5) hydromorphic GSs show great diversity of conditions; (6) GSs in different terms simultaneously passing from one condition to another belong to «stable blocks» and GSs with unstable behavior are named "blinking". Mapping of conditions based on landscapes enables the recognition of the main features of dynamics, which will contribute to improvement of forecasting and control of GSs. (RFBR № 14-05-00618a)



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## Agroecological land evaluation and land use of the Ustianskoe plateau (southern Arkhangelsk oblast)

Ksenia A. KINGSEP, Alexander I. GLUKHOV, Daniil N. KOZLOV (Russian Federation)

Modern landscapes are the result of the dynamic interaction between natural and cultural driving forces. Natural and anthropogenic biomes, especially agricultural landscapes, are unstable systems with a weak capacity for self-regulation. Knowledge about the interactions between subsystems of agricultural landscapes facilitates appropriate management strategies. Purpose of this research is agroecological land evaluation and land use dynamics analysis for the unique agricultural area in the middle taiga in XVIII-XXI centuries. The study was conducted at a local scale at Ustianskii key area (south Arkhangelsk oblast). Main objectives are: (i) land use reconstruction for XVIII, XX, XXI centuries (using General survey materials, maps and Landsat imagery), (ii) agroecological land evaluation, (iii) to calculate share of soils with limiting conditions for the elements of a regular grid (iv) to analyze reasons of land use dynamics (agroecological, climatic, distance to settlements, water bodies, roads). We identified that during last 300 years share of agricultural lands doubled, while share of forests decreased by more than 2 times. Increase in share of arable lands occurred on account of lands with limited conditions. These factors (erosion, waterlogging, bedrock) are crucial for land use heterogeneity. We revealed that in 1950s arable land's extent exceeded potential land capacity for agriculture. Therefore, we can predict that the least convenient lands will be abandoned. Also we state that distance from rivers and villages does not significantly contribute to land use structure.



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**Degradation of arid landscapes of Azerbaijan under anthropogenous pressure**

Elbrus ALIZADE, I.Ya KUCHINSKAYA., S.Yu. GULIYEVA (Azerbaijan)

Territory of Azerbaijan, especially its arid and semiarid low mountain - foothill regions making about 60 % of a total area, under the influence of natural and anthropogenous factors are exposed to more intensive development of process of desertification in comparison with other South Caucasian states. On extensive areas arid and semiarid landscapes get new qualities from constant anthropogenous influence, various updatings of an anthropogenous origin are formed. In connection with their unsystematic use active exogenic processes become more, degradation of unstable mountain and foothill geosystems increases, natural balance is broken, there is destruction of natural vegetation, pasture cattle on poorly productive pastures, an infringement of hydrological systems, impoverishment of underground waters, the big concentration of cattle on pastures to a small stock of a forage, repeated засоление soils in connection with without drainage system. Ability of geosystems to self-regulation is broken, productivity of geocomplexes sharply falls and there are potential centers of development of processes of desertification on extensive areas as a result of these events. For the purpose of revealing of the general condition of modern landscape geocomplexes and degree of their susceptibility to process of desertification arid and semiarid landscape complexes are analyzed by us, it is given an expert estimation of their susceptibility to these processes, large-scale mapping of territory on desertification degree is spent: are allocated practically no desertification, low desertification, middle desertification and high desertification complexes. Areas with low degree of desertification towards increase in areas with strong and average degrees of desertification are observed. For more exact diagnostics of processes of desertification detailed research of material structure of landscapes, including is necessary also for migration of chemical elements.



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# C12.10 Gender and Geography

## Gendered Crime and Spaces: An approach in Feminist Geography

**Chairperson(s):** *Sahab DEEN*

- Iron from ice? The temporal-spatial analysis of women's victimization and empowerment in the urban landscape of gendered crime

  *Yu-Chieh HSIEH (China)*

- Gender and urban ethno-communal conflicts in developing country: Nigeria

  *Raimi Abidemi ASIYANBOLA (Nigeria)*

- Dowry Death: A Cultured Killing of Women across Space and Society in India

  *Sahab DEEN (India)*

- 'Non-consensual sexual experience among Indian ever married women'

  *Tapash BISWAS (India)*

## Gendered Life-Courses

**Chairperson(s):** *Joos FORTUIJN*

- Locating Women in Indian Society: A Historical Analysis of the Female's Life-Course

  *Sahab DEEN (India)*

- Decent Work Deficit in Domestic Work: A Focus on Part-Time Women Workers in Delh

  *Sudipta SARKAR (India)*

- Intergenerational Relations and Changing Elderly Care: Emerging issues of elderly care in Delhi and Kolkata

  *Selim JAHANGIR, Anindita DATTA, Ajay BAILEY (India)*

- Consciousness of Youth about Having Children and Gender Role Division in Japan

  *Eriko IKEYA (Japan)*

- Children's physical activity and urban vitality. Assessing the gendered role of the built environment at determining healthy mobility habits.

  *Oriol MARQUET, Miralles-GUASCH, CARME (Spain)*



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**Factors Affecting Women's Education: Gender, Space, Culture and Society**

**Chairperson(s):** *Sahab DEEN, Gloria KUZUR*

- Gendered Educational Deprivation among the Tribals in Chotanagpur: A historical perspective

  *Vijay BARAIK, Gloria KUZUR (India)*

- An Assessment of Socio-economic, Cultural - Geography, and Gender based Deprivation in Higher education in India

  *Sachin LOKHANDE, Donald MAWKHLIENG (India)*

- Educational Status - Level and Gender Differentials in Rural Literacy Rate: A Case Study of Rajasthan (India)

  *Sawan JANGID (India)*

**POSTER EXIBITION:**

**Gendered Crime and Spaces: An approach in Feminist Geography**

- Domestic Violence Against Women: A study of Mirzapur District Uttar Pradesh

  *Sher SINGH (India)*



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**Iron from ice? The temporal-spatial analysis of women's victimization and empowerment in the urban landscape of gendered crime**

*Yu-Chieh HSIEH (China)*

Gendered geographies of crime and fear have been scholars' growing concern since 1980s. Existing studies have explored women's fear of violence, gender gap in offending, the experiences of women's imprisonment etc. However, most of research is conducted beyond Asian societies. In addition, temporal investigation of gendered crime has been much less explored alongside with spatial analysis. Apart from aforementioned limitations, a few studies discussing Taiwanese geographies of crime primarily focus on robbery and burglary, and thus are lack of gender perspective. Therefore, this research aims to explore Asian experiences of gendered crime by taking a Taiwanese case as an example to conduct spatial analysis of women's victimization in Taichung City, which is notorious for its high crime rate. Specifically, the temporal and spatial changes of gendered crime (e.g. offenses against marriage and family, offense against morality, sexual assault, and sexual harassment) are investigated in order to identify hotspots of concentrated crime events. Methods of GIS and geospatial analysis are adopted in mapping the urban landscape of women's insecurity. This research aims to produce empirical data and discussion as the foundation for the law enforcement parties to create a safer city for women.



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**Gender and urban ethno-communal conflicts in developing country: Nigeria**

*Raimi Abidemi ASIYANBOLA (Nigeria)*

Existing research on urban violence in different part of Nigeria, have only examined causes and consequences of conflicts. This study examines the role of gender in ethno-communal conflict in Ife-Modakeke conflicts, Nigeria. The primary database for the study was obtained through a survey of 390 households. Result shows that women performed more feminine role than masculine role and more conflict-mitigating role than conflict sustaining role during conflicts. Women were found to have actually performed more gender roles ("masculine" and "feminine"), conflict sustaining and mitigating roles than perceived. Significant difference is found between women and men's perception of the conflict. Women's perception of the conflict is more than that of men. Also, significant difference is found between women and men's attitude towards violence/conflict/use of weapons. Men have more attitudes towards violence/conflict/use of weapons than women. Result of the correlation analysis shows that there is significant relationship between conflict sustaining role performed by women and inter-marriage indicators, landownership, perception of the conflict and attitude towards violence/conflict/use of weapons. Significant relationship is found between conflict mitigating role performed by women and age, marital status and employment status. Conflict sustaining role show a negative relationship with indicators of inter-marriage, and positive relationship with landownership, perception of the conflict and attitude towards violence/conflict/use of weapons. Conflict mitigating role show a positive relationship with marital status and employment status and negative relationship with age. For sustainable peace, policies that encourage inter-marriages, employment generation, and mind set reorientation towards peaceful co-existence should be pursued.



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## Dowry Death: A Cultured Killing of Women across Space and Society in India

*Sahab DEEN (India)*

"India is most dangerous place in the world to be born as Girl (United Nations Report 2013)". In Indian society dowry death or bride-burning are common phenomenon in daily news. Dowry is a transfer of property from bride's family to that of the bridegroom, at the time of marriage. It occurs when a young woman is murdered by her husband or his family for her family's refusal to pay additional dowry. According to National Crime Records Bureau, incidence of dowry death has been increased by 70.24% during the period of 1990-2012. The main objective of the paper is an attempt to study the spatial and temporal analysis of dowry death across the Indian states. The paper is based on quantitative work of secondary data extracted from National Crime Records Bureau 1990-2012. A cartographic techniques including diagraph, choroplething using GIS map, have been used to show the regional pattern and change in dowry deaths. Firstly, paper discusses the evolution of dowry tradition in the historical and religious scripture and tried to explore the socio-psychological factors deep-rooted in the psyche of the society for demand of dowry which finally culminates in the form of bride-death. Secondly, explains the regional pattern of dowry death along with temporal change during 1990-2012. Analysis of the results reveals that there is increasing trend of dowry death among the major states like Bihar, Uttar Pradesh and Madhya Pradesh; they also records highest numbers of dowry death. This increasing trend indicates the traditional customs and practices described in the religious scriptures have been entrenched in the psyche of people which strengthens dowry system in India.



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**'Non-consensual sexual experience among Indian ever married women'**

*Tapash BISWAS (India)*

Sexual behavior from a social prospective has important public health concern as sexual activities among females in India takes place within socially sanctioned institution of marriages. However, marriage does not inherently make the sex safe, wanted or pleasurable. This paper presents evidence on the magnitude of and factors underlying non-consensual (coerced) sexual experiences among married women from a cross sectional survey conducted by NFHS-3 team. It also examines the pattern across groups of different demographic and socio-economic characteristics. Logistic regression reveals that the age at marriage, level of education, caste, religion and region, are the main factors that consistently differentiate sexual behavior across social groups. A number of factors such as partner's consumption of alcohol, standard of living of the spousal family and respondent's current working status were also found to be correlated with coerced sex (unwanted sexual) experiences. The study will hopefully provide knowledge necessary in designing more informed interventions for the victim.



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IGU2015 – 651

**Locating Women in Indian Society: A Historical Analysis of the Female's Life-Course**

*Sahab DEEN (India)*

In India, women's domains of life-course are deep-rooted in the Indian social structure. Indian Hindu-society is a highly patriarchal and caste-based hierarchal society in which domains of women are highly gendered i.e. place, rights, freedom and time bounded character of life courses. The gendered domains are the most crucial in determining the status and condition of female's life courses. A subordinate attitude towards women in India goes to long historical course of time. Subordination of women is underscored in a well-known verse in Manusmriti: "In childhood a female must be subject to her father, in youth to her husband, when her lord is dead to her sons; a woman must never be independent". In Indian society, women and shudra have been treated as slaves in view of their unfair position to men in a well-known verse in Manusmriti and subordinate attitude towards the women are justified and have their sanctity by the scriptures (The Laws of Manu, 1964). This subordinate attitude towards women still exists in the Indian society, especially in rural areas. Thus, major objectives of paper are: i) to study the evolution of subordinate attitude towards women historically, ii) to analyze the female's domains and rights during their life courses, and iii) to identify the current gendered domains and rights and examine the socio-cultural status of women in Indian society. The paper conceptualizes the female lives in Indian society, as a trajectory through major life events which are considered as critical transitions in different life courses. Moreover, it analyzes the current socio-cultural and economic rights at different stages of women's life: childhood, youth, adulthood or old age at different domains of life such as household, public places, education, rights, freedom and mobility from geographical perspectives. Finally, it concluded that the present socio-cultural status of women is the culmination of subordinated attitudes towards them during the long history of Indian society.



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IGU2015 – 3692

**Decent Work Deficit in Domestic Work: A Focus on Part-Time Women Workers in Delh**

*Sudipta SARKAR (India)*

India has more than 4 million of domestic workers (NSS 2004-05) . In urban areas, within total female working population about 11 percent women are engaged in paid- domestic service, which is next to education. And yet in India domestic workers are not covered under labour legislation; they suffer from different work uncertainties and unhealthy work life which hampers their overall wellbeing. On 16th June 2011 Convention concerning decent work for domestic workers no. 189 was given by ILO. The Convention consists of basic rights and principles in the form of measures meant to protect and improve the situation of these workers worldwide. As far about seventeen ILO member nations have ratified the convention by 2014, whereas India being an active member state is still far from ratification. Drawing upon the NSSO 61st round, this paper explores the socio-economic status of domestic workers in urban India followed by a study on Delhi to understand the overall profiles of these workers as also examines their work life by analyzing their working terms and conditions within the framework of decent work measures recommended by the ILO. Moreover attention is paid to reflect the need of ratification of convention no. 189 in India. Keywords: Domestic work, Informal sector, ILO, Women workers, India, urban, Delhi.



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## Intergenerational Relations and Changing Elderly Care: Emerging issues of elderly care in Delhi and Kolkata

*Selim JAHANGIR, Anindita DATTA, Ajay BAILEY (India)*

Traditionally Indian older adults were cared for by their immediate family members; moreover, respect for the aged was integral feature of the culture. The present young generation, living in sandwich generation, is going through transition. They are in a situation where they are required to provide care for their elderly on one hand and their own children on the other hand. In this way they are sandwiched as principal care providers for two generations. But now this delicate dialectic care relationships between the care receivers and the care providers have greatly changed and are being re-negotiated. This changing intergenerational relation has created a care differences or care gap in the present day care practices both in the family care and in institutional old age care. This care gap is viewed differently by both the elderly who see it as a function of societal changes and their care givers who are sandwiched between the care needs of two generations. The main purpose of this paper is to address the emerging issues in the dialectic care process in the words of elderly men and their care providers. The paper gives voice to the issues of care gap as perceived by the care recipients and providers. A total number of 79 in depth interviews were collected out of which 46 were elderly men and 33 were their care givers in both the spaces of Delhi and Kolkata. Keywords: Intergenerational relations, Elderly care, Emerging Issues, Care Gap



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IGU2015 – 2644

## Consciousness of Youth about Having Children and Gender Role Division in Japan

*Eriko IKEYA (Japan)*

In the studies about birth rate in industrialized countries, many authors insist more people tend to be single and childless life. Japan is suffering from low birth rate and decreasing population. So we want to know how young people think about having children and family formation. To know this, I used data gathered in seven countries by Cabinet Office in 2013 and by myself. Results are following. Average numbers of children young people want to have in the future in Japan are the smallest among countries, but the differences in number compared with other countries are a little. Additionally average number of children is not proportional to the Total Fertility Rate of those countries. These suggest that actual number of children and fertility rate are influenced by circumstances. Speaking about circumstances, insufficient child care support, work life balance, education cost and severe employment environment have relation to low fertility rate in Japan. In addition to these, gender role division should to be investigated. Two in ten Japanese youth agreed that men should work outside of the home and women should stay home and take care of it. Four in ten disagreed and disagree rate was the smallest among countries. Another four in ten replied do not know. These answers reveal ambivalent stance of Japanese youth about gender roles. In the background, it should be pointed that social circumstances are still unequal and working conditions are losing stabilities.



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IGU2015 – 1411

**Children's physical activity and urban vitality. Assessing the gendered role of the built environment at determining healthy mobility habits.**

*Oriol MARQUET, Miralles-GUASCH, CARME (Spain)*

Over the last years, there is a growing concern on the issue of children's lack of physical activity and the effect of noncomounicable diseases among children and youngsters. Health problems like morbidity, cardiovascular diseases and diabetes are increasingly being found among children of young age, due in part for low levels of physical activity and a lack of outdoor activities. The World Health Organization (2010, p. 19) advises that children between 5 and 17 years of age should engage in 60 minutes a day of moderate to vigorous intensity physical activity in order to avoid future health problems (Galvez, Meghan, & Yen, 2011). Besides activities such as sports and playground, children earn their larger part of physical activity from non-motorized transport particularly from walking (Sandercock, Angus, & Barton, 2010). To this effect, research has found some attributes of the built environment such as density and diversity to be closely related with walking for transport, suggesting that designing walkable cities might promote healthier mobility habits among children. This paper focuses on three main factors of children's public health - physical activity, modal choice and activity engagement - and aims to analyze how the urban vitality of the streets - as a fundamental part of the built environment - affects boys and girls health outcomes. Results show children living in a vital environment gaining 23% more physical activity from transport and engaging in 19% more activities than those living in non vital areas. Most importantly, results also suggest a gendered effect of the built environment, as girls were less susceptible to the attributes of the built environment than boys. Galvez, M. P., Meghan, P., & Yen, I. H. (2011). Childhood obesity and the built environment: a review of the literature from 2008-2009. Current Ooinion in Pediatrics, 22(2), 202–207. Sandercock, G., Angus, C., & Barton, J. (2010). Physical activity levels of children living in different built environments. Preventive Medicine, 50(4), 193–8. World Health Organization (WHO). (2010). Global Recomendations on Physical Activity for Health (p. 60). Geneva. Retrieved from http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/ index.html.



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**Gendered Educational Deprivation among the Tribals in Chotanagpur: A historical perspective**

*Vijay BARAIK, Gloria KUZUR (India)*

The structural strategies of education introduced by the colonizers during the colonial regime has discriminated indigenous women by detaching their past where they were the repositories of knowledge and have left a gap that have marginalized the oppressed group both socially and economically . The nature of social discrimination so introduced with the formalization of education had demolished the indigenous ways of knowledge sharing emphasized by shedding away of the past and adopting the new system. The educational attainments of tribal women have remained the lowest among social groups in India till recently is an indicator that there has not been adequate improvements but that the bridging gap has further widened. Tribal women in the central tribal belt comprising of the Chotanagpur region has been one of the most deprived. The tribal population in this region has witnessed the highest poverty and is deficient in health and educational parameters. The paper investigates into the origins and nature of the educational discrimination of tribal women in Chotanagpur from a historical perspective. The study will be based on historical literatures and documents tracing into the gendered educational deprivation imposed by the colonizers in the region. The local effect of the colonial education system will be studied from the field based narratives of elderly females who had been a witness of the historical transition phase in Chotanagpur regions among selected tribal groups.



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**An Assessment of Socio-economic, Cultural - Geography, and Gender based Deprivation in Higher education in India**

*Sachin LOKHANDE, Donald MAWKHLIENG (India)*

India, a country known for its rich diversity among its population suffers from different imbalances in society. For example section of its population is still being deprived and under developed in the field of education. Different castes and women are subjected to backwardness in the Indian society which still exist due to societal customs, traditions, taboos, beliefs etc. This deprivation also varies from region to region and sex wise. This paper ascertain the deprivation of education in various sections of the Indian society which could better explain the inequalities in educational attainment. The paper also describe the variation in educational attainment among different castes, religion and region in India. National Sample Survey Organisation (NSSO: 52th round, 1995-96; 64th round, 2007-08; 68th Round, 2011-12) data were used to achieve the objective of the study. Level and trend analysis were used to understand the educational scenario over time. Descriptive statistics and multivariate analysis were used to understand the deprivation according to religion, region, caste and gender. The study shows that there is a clear deprivation of educational attainment among Muslim, Schedule Caste and Schedule Tribe and females in India which signify that more needs to be done in policy making process for their upliftment.



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IGU2015 – 0382

**Educational Status - Level and Gender Differentials in Rural Literacy Rate: A Case Study of Rajasthan (India)**

*Sawan JANGID (India)*

Education is the backbone of national development and is widely accepted as an instrument of social change. India has been an active partner in the worldwide movement for education for all that began in 1990 in Jomtien followed by Millennium Development Goals (MDG). The important issue which needs immediate attention is to achieve MDG targets in education. The third millennium development goals aim to promote gender equality and empower women. This entails us to eliminate gender disparity in primary and secondary education preferably by 2005 and at all levels of education not later than 2015. Further several other millennium development goals such as eliminating poverty and hunger, reducing child mortality, improving maternal health, etc. typically depend on the status of women and their education. Therefore, it is necessary to constantly monitor and take stock on the status of women education to safeguard the millennium development goals. The present paper seeks to map the status of education in of Rajasthan and draw some conclusions on the progress made and ought to be made with respect to MDG gender goals. The attainment of education in India is ought to be measured by the indices of literacy. The study of present paper is restricted to rural literacy rate only. The study of status incorporation trends, patterns and interacting factors related to quantitative and qualitative aspects of rural literacy especially women education has been carried out for 1961 and 2011 as reference year. For this purpose district - wise spatial distribution patterns, sex differentials (male - female gap in literacy) and disparities in the levels of literacy have been calculated and analyzed in the study area during last 50 years. The main data sources are census reports published by Government of India.



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IGU2015 – 0249

## Domestic Violence Against Women: A study of Mirzapur District Uttar Pradesh

*Sher SINGH (India)*

Domestic violence against women in India is endemic (Ganguly, 2012). It is a common phenomenon in daily life in Indian society. Around 70% of women in India are victims of domestic violence (Chowdhury, 2006). National Crime Records Bureau (NCRB) 2006, reveal that one case of cruelty committed by either the husband or relative of the husband occurs every nine minutes. According to NCBR report 2012, in the recent past year domestic violence against women has been increased rapidly. It has increased by 70.05% during the period 2005-2012. Thus, the main objective of the research paper is an attempt to analyze the social attitude for domestic violence against women and try to find the root causes domestic violence against women in Indian society. The research paper is based on qualitative work of primary data collected from different locations of Mirzapur district of Uttar Pradesh, India. Besides, different government publications and reports have been used for supplement to analysis of the study. Paper comprises two major sections; first one discusses the social attributes on the issue of domestic violence against women. Second section has tried to explore the socio-economic factors engrained in the social-psyche of the Indian society which promotes domestic violence against women. Trend analysis of domestic violence against women reveals that in recent year, there is continuously increasing incidence of domestic violence against women at National level as well as regional. Results of primary qualitative data indicates that there are existence of several socio-economic and cultural traditions and customs which are entrenched in the mindset of patriarchal Indian society which plays major role to encouraging the domestic violence against women despite the fact that women in India are legally protected from domestic abuse under the Protection of Women from Domestic Violence Act 2005.



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# C12.11 Geographical Education

## Geography Teacher Education 1

**Chairperson(s):** *Michael SOLEM*

- Role of universities in ecological education of youth in All-Russian Children's Center "Orlyonok"
  *Zinaida GORDEEVA, Marina PETRUSHINA, Olga POSTONOGOVA (Russian Federation)*
- Geospatial Teaching Enrichment Modules for Teacher Education
  *Michael SOLEM (USA)*
- Kazdağlari (Ida Mountains) As A Training Area Of Geopark And Geotourism
  *Kamile GÜLÜM (Turkey)*
- Developing Geography-specific pedagogical understanding: lessons with a professional compass
  *Clare BROOKS (United Kingdom)*

## Geography Teacher Education 2

**Chairperson(s):** *Joseph STOLTMAN*

- Using Modified Problem-based Learning: a pedagogy to prepare geography student-teacher
  *Tammy KWAN (China (Hong Kong))*
- Activity technologies in school geographical education (from experience of an experimental platform of Moscow State Pedagogical University)
  *Elena TAMOZHNIAIA, Elena BELOVOLOVA (Russian Federation)*
- Educational Field Trips are Alive and Well: The Contemporary Learning Environment
  *Yael SNEH (Israel)*
- Doing Geography: The Role of the Body in Singapore Pre-Service Teachers' Subject Conceptions and Practice
  *Tricia SEOW (Singapore)*

## Geography Teacher Education 3

**Chairperson(s):** *Joop van der SCHEE*

- An Assessment of the Beginning Teachers' Conceptions of Fieldwork in Geography in Singapore
  *Geok Chin Ivy TAN, Qiu Fen Jade CHEN (Singapore)*
- Teachers as curriculum leaders: a GeoCapabilities Approach
  *Karl DONERT (United Kingdom)*



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- The Transmedia Storytelling in teaching Geography: the case of the "Transmedia Storytelling Project Carioca Traffic"

  *Yan NAVARRO (Brazil)*

- Teachers envisioning future geography education at their schools

  *Tine BÉNEKER, Hans PALINGS (The Netherlands)*

**Geospatial technologies in geographical education 1**

**Chairperson(s):** *Joop van der SCHEE*

- GIS technology in geograchical education

  *Anna ALEXANDROVA (Russian Federation)*

- From Space to Schools – A Learning Portal on Earth Observation from the ISS

  *Andreas RIENOW, Sascha HEINEMANN, Gunter MENZ (Germany)*

- The power of maps – empowering children through geomedia

  *Inga GRYL (Germany)*

- Spatial thinking and smart city learning with GIS in secondary education

  *Rafael GONZÁLEZ (Spain)*

**Geospatial technologies in geographical education 2**

**Chairperson(s):** *Osvaldo MUNIZ*

- GNSS Reference Stations of Lomonosov MSU Faculty of Geography

  *Alexander SUCHILIN (Russian Federation)*

- GeoMobiel: an opportunity to integrate geo-ict in secondary schools in Flanders?

  *An STEEGEN, Jeroen STIERS, Lieselot LAPON, Bart DE WIT, Koen DE MUNTER, Philippe DE MAEYER, Frank CANTERS (Belgium)*

- Current issues of the GIS and Remote Sensing in the Secondary school of Mongolia

  *Bat-Erdene TSEDEV, Ser-Od TSEDEVDORJ, Enkhjargal PUREVSUREN, Uranchimeg GETSEL, Amgalan AVHINSUKH (Mongolia)*

- Understanding the Earth with Satellite Images – Development of an Adaptive Learning Platform for the Application of Remote Sensing in Schools

  *Kathrin VIEHRIG, Vera FUCHSGRUBER, Nils WOLF, Alexander SIEGMUND (Switzerland)*



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**Geospatial technologies in geographical education 3**

**Chairperson(s):** *Clare BROOKS*

- MAP, MAP USE and MAP DESIGN: An Evaluation in Turkey

  *Ilkay BUGDAYCI, Ibrahim Oztug BILDIRICI (Turkey)*

- GIS in teaching geography

  *George NIZHARADZE (Russian Federation)*

- Augmented Reality (AR) Information System for Geography Education

  *Ysohiasyu IDA, Satoru ITOH, Hiroaki AKIMOTO, Yoshihiro UGAWA, Aya FUKUCHI, Jun TSUTSUMI (Japan)*

**Geospatial technologies in geographical education 4**

**Chairperson(s):** *Michael SOLEM*

- The Introduction of Use of Statistics in Education (I-Use): the case of Use of Statistics in the Geography Curriculum

  *Luc ZWARTJES (Belgium), Karl DONERT (United Kingdom), Aikaterina KLONARI*

- What do undergraduate students think of the use of Virtual Field Trips in geography education?

  *Martens LOTTE, A. STEEGEN, G. VERSTRAETEN (Belgium)*

- Use of the computational-informational web-GIS for the development of climatology students' skills in modeling and monitoring of climate change

  *Yulia GORDOVA, Yu. V. MARTYNOVA, T. M. SHULGINA, E. P. GORDOV (Russian Federation)*

**Integrated school discipline and geography 1**

**Chairperson(s):** *Michael SOLEM*

- La formation géographique des écoliers à l'Université de Moscou

  *Marina ARSHINOVA, Natalia ALEXEENKO, Marina KORSHUNOVA, Valery ALEXEENKO (Russian Federation)*

- Geography and the Integrated Curriculum in Japanese Elementary school: In Case of Living Environment Studies

  *Hyunjin KIM (Republic of Korea)*

- Development Of Integrated Programs In The Earth Science Museum At The Lomonosov Moscow State University

  *Marina PIKULENKO, L.V. POPOVA, I.P. TARANETS (Russian Federation)*



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- Integrated Approaches in Tertiary Education: Geography in Classical University (Example: Peoples' Friendship University of Russia)

  *Veronika KHOLINA (Russian Federation)*

**Integrated school discipline and geography 2**

**Chairperson(s):** *Joop van der SCHEE, John LIDSTONE*

- Project "We Propose!": the challenge of local territorial citizenship

  *Sérgio CLAUDINO, Rui SANTOS, Helena ESTEVES, Roberto MACHADO, Lana NASCIMENTO, Ivaine TONINI (Portugal)*

- Geography and multicultural education

  *Alexander LOBZHANIDZE (Russian Federation)*

- Humanistic paradigm in geography

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**National and International assessment**

**Chairperson(s):** *Lex CHALMERS*

- Assessing systemic thinking in kindergarten and primary school using the topic '(renewable) energy' – empirical results and issues for the future

  *Kathrin VIEHRIG, Alexander SIEGMUND (Switzerland)*

- Possibilities of an international assessment in geography

  *Theresa BOURKE, Rod LANE, John LIDSTONE (Australia)*

- Seeking gold: a review of the IGU International Geography Olympiad

  *Lex CHALMERS (New Zealand), Sue LOMAS (United Kingdom), Kathryn BERG (Australia), Tomasz SAWICKI (Poland)*

- English language classes is an essential element in the preparation of Russia's team for International Geography Olympiads

  *Irina OKS (Russian Federation)*

- Teaching Environmental Values and Responsible Behavior through Geography Education: problems &opportunities

  *Nahid FALLAHIAN (Iran)*



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**National curricula and international standards 1**

**Chairperson(s):** *Tine BENEKER*

- A Comparison of the Geography Content Standards for Middle Schools in China and the United States

  *Fengtao GUO, Joseph P. STOLTMAN, Yushan DUAN (China (Beijing))*

- The Introduction of Geography Content Standards in Germany: Using Q Methodology to Explore Teachers' Views of Standards

  *Joseph P. STOLTMAN, Fengtao GUO (USA)*

- A future for school geography in Flanders

  *Luc ZWARTJES (Belgium)*

**National curricula and international standards 2**

**Chairperson(s):** *Clare BROOKS*

- Geography scholarship from classroom to the public intellect

  *Lex CHALMERS (New Zealand)*

- Training teachers of geography and professional practice in Brazil and Portugal: relationship between university and school

  *Maria Anezilany Gomes do NASCIMENTO (Brazil), Sérgio Claudino Loureiro NUNES (Portugal)*

- Comparative analysis of Higher Geographical Education in Russia and Europe

  *Nina ALEKSEEVA, Oxana KLIMANOVA, Alexey NAUMOV (Russian Federation)*

- Role of Urban Governance for Indian Cities

  *Tapash BISWAS, Ashok Kumar SAHAY (India)*

**Empirical and classroom research 1**

**Chairperson(s):** *Joseph STOLTMAN*

- An evaluation of serious games and real word data on student outcomes in university level geographic education

  *Daniel ERVIN, David LOPEZ-CARR, Lumari PARDO-RODRIGUEZ (United States of America)*

- The Research of Board Games to Geography learning on Junior High School Students' Learning Motivation and Academic Achievement

  *Hui CHIU (Taiwan)*



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- Initial teacher training and education geography: an experience with the PIBID in Ceara, Brazil

  *Maria Anezilany Gomes do NASCIMENTO (Brazil)*

- Building a Research Coordination Network for Geography Education

  *Michael SOLEM (United States of America)*

- Incorporating Place-based Education in Teaching Urbanism

  *Huiwei CHEN, Roger CHAN, Yi SUN (China)*

**Empirical and classroom research 2**

**Chairperson(s):** *Theresa BOURKE*

- The Shanghai Model for Online Geography Education

  *Osvaldo MUNIZ (United States of America)*

- System Competence in Geography Education - an empirically validated structure and stage model

  *Rainer MEHREN, Armin REMPFLER, Eva Marie ULRICH-RIEDHAMMER, Janine BUCHHOLZ, Johannes HARTIG (Germany)*

- Exploring children's perceptions of the environment

  *Tomas TORBJÖRNSSON, Bryan WEE, Linda OLDEBRING (Sweden)*

**International links and innovations 1**

**Chairperson(s):** *Joop van der SCHEE*

- The Geo Future School

  *Joop van der SCHEE (The Netherlands)*

- Crowd Collaborative Geography Communities: A New Model in Informal Geography Education

  *Osvaldo MUNIZ (United States of America)*

- Education and modern challenges: experience of the environmental management department

  *Alla PAKINA, Elena GOLUBEVA, Michail SLIPENCHUK (Russian Federation)*

**International links and innovations 2**

**Chairperson(s):** *Eje KIM*

- Sharing knowledge via new technology

  *Aya GREENFELD (Israel)*



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- Visual Literacy And Geography Textbooks – Eye-Tracking Study

  *Yvonne BEHNKE (Germany)*

- African Network for Geo-Education: Challenges and Perspectives

  *Kholoud ABDELMAKSOUD, Abdelouahed LAGNAOUI (Egypt)*

- Beyond stereotypes of Asian women in World Regional Geography: Revisiting Southeast Asia for feminist teaching and researches

  *Eje KIM (Republic of Korea)*

## POSTER EXHIBITION

**Empirical and classroom research**

- Promoting Indigenous environmental knowledge in senior high school, a case study of Tayal, northern Taiwan

  *Yu-lan NI, Da-wei KUAN, Su-Min SHEN (China)*

- A Seat at the Table: Using Deep Learning to Engage Students in Food Geography

  *Karen S. BARTON (United States of America)*

- The formation of cognitive interest in the study of the geography of Russia in the framework of the Russian Geographical Society's project "Lessons of geography"

  *Ivan KOLECHKIN (Russian Federation)*

- Geographical education in a virtual globalization world of knowledge explosion

  *Hein RAGHOEBAR (Suriname)*

**Geography teacher education**

- Modern geography: cognitive levels

  *Vyacheslav SUKHORUKOV, V.P. SOLOMIN (Russian Federation)*

- Conception and Development of an Online Database for Outdoor Education

  *Anne-Kathrin LINDAU, Kathrin JÄGER, Christian DETTE, Detlef THÜRKOW (Germany)*

- Primary Geography Education: curricula and methods of teaching

  *Marina SMIRNOVA (Russian Federation)*



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**National and international assessment**

- School Based Geography Assessment In A Context Of A New Educational Standard In Russia
  *Olga KHLEBOSOLOVA, Laura TSAREVA (Russian Federation)*

**Geospatial technologies in geographical education**

- Combing of field practice and lectures for ecology students study
  *Alexandra GORETSKAYA, A.V. EVSEEV (Russian Federation)*
- Geoportal in geographical education: advancement of cartographic collections
  *Marina GOLYASHEVA (Russian Federation)*

**International links and innovations**

- Importance in the secondary education institutions of the European Union Comenius Projects: Kadikoy-Intaş High School Comenius Projects Examples
  *Gulcin ERTEK, Ahmet ERTEK (Turkey)*
- Training manual "Ecology and balanced nature management" for secondary schools
  *Ludmila BAGROVA, V.A. BOKOV, L.M. SOTSKOVA, L.Y. GARKUSHA (Russian Federation)*
- Russian-Korean students and teachers exchange program as part of geographical education
  *Arkady SARAVAISKY (Russian Federation); SONG Sun Hee, YOON Young Ki (Republic of Korea)*

**Integrated School discipline and geography**

- The "Lomonosov" Geography Olympiad for schoolchildren as an innovative way of identifying and selecting talented young people
  *Lidia ISACHENKOVA, Yulia FUZEINA, Mikhail KAZMIN (Russian Federation)*



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**Role of universities in ecological education of youth in All-Russian Children's Center "Orlyonok"**

*Zinaida GORDEEVA, Marina PETRUSHINA, Olga POSTONOGOVA (Russian Federation)*

The universities must play a vital role in ecological education of children and young people. The complex approach can be more affective in this education due to the integrity of nature. This approach was realized by teachers and students of Faculty of Geography of Lomonosov Moscow State University and some other Russian universities in All-Russian children's Center "Orlyonok" which is the biggest Federal Centre with the whole year round education for the children from all regions of Russia. One of the main trends of ecological education is the involving the educators and pupils of "Orlyonok" and domestic schools in field studies of landscapes and the currant ecological state of their nature components (water, soil, vegetation). The teachers and students show the main methods of study using different modern instruments, help to collect field data. They also worked out ecological programs for pupils and methodical papers to specialists of "Orlyonok", trained the pupils and participated in ecological conferences and other activities and explained the global and region ecological problems. Some landscape maps and special maps of modern ecological situation, activity of nature processers, dynamics of unique sand beach and etc. have been compiled for the study area as well as the maps of natural trails. The organization of such trails for children of different age is one of the effective kinds of education and training with involving youth in active getting knowledge of nature and local ecological problems. The organization of All-round meeting of children ecological unions from different regions of Russia including the field practice on the base of "Orlyonok" is another new trend in education of youth by geographical faculties of universities.



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## Geospatial Teaching Enrichment Modules for Teacher Education

*Michael SOLEM (USA)*

This presentation will report the outcomes of a project investigating how geospatial resources, materials and tools (RMTs) will potentially operate within interdisciplinary pedagogical frameworks. The project, conducted in cooperation with the Esri-ConnectED initiative, was designed to assess the likely impacts of ArcGIS Online on geographic learning and thinking in STEM classrooms, and to identify potential obstacles affecting future dissemination of geospatial RMTs in teacher preparation programs and schools. The project created a ArcGIS Online-based Geospatial Teaching Enrichment Module focusing on a geographic investigation and analysis of water consumption and patterns of usage and environmental impacts in Texas. Pre-service students in math, science and social science education programs at Texas State University were trained with the module during one academic semester. Additional testing and evaluation was performed with teachers in collaboration with state Geographic Alliances. Data gathering and analysis focused on the following questions: 1) How do math, science and social science faculty, pre-service, and in-service participants with the Geographic Alliances perceive the effectiveness of the prototype module as a teacher education resource? 2) To what degree did the training with the prototype module impact teachers' spatial thinking skills and analytical abilities?



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## Kazdağlari (Ida Mountains) As A Training Area Of Geopark And Geotourism

*Kamile GÜLÜM (Turkey)*

The aim of this study is determined the potential of Mount Ida (Kazdağları) in order to use geopark and geotourism education. Ida Mountains is a unique world heritage because of easy transportation facilities, geological and geomorphological formations, coastlines, water resources, climate, vegetation, historical, cultural and myhthologic richness. Especially, They have all combination of geopark that necessary for nature education.Thus Ida Mountains is quite suitable for geopark education. When the nature education center,monitoring of Routes, Walkways and watching to be established, It can be started geopark and geoturizm education at all levels from pre-school to the University. Ida mountains (Kazdağları)' source values are suitable for this education. Thus the region may have a separate place not only for tourism but also as a world's nature education center Keywords: Ida Mountains (Kazdağları), geopark education, geotourism education, sustainability.



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**Developing Geography-specific pedagogical understanding: lessons with a professional compass**

*Clare BROOKS (United Kingdom)*

In this paper I explore what sort of teacher education pedagogy is best suited to support student teachers in making the transition from being a learner of geography to a teacher of geography. The challenge is for pre-service teachers to develop the necessary professional expertise alongside high quality practice-based understanding. To do this, teachers require more than just knowledge of geography, but a nuanced and ethical understanding that reflects the disciplinary tradition of the subject, as well as a detailed understanding of what it means to learn geography. This is a particular challenge for such a wide-ranging and diverse discipline. Using data collected from a range of experienced geography teachers, I analyse the significance of having a subject-based professional identity to developing high quality and sustaining professional practice. Experienced teachers describe drawing upon their "subject stories" which appear to act as a "professional compass" to guide their professional practice. This professional compass reflects a moral and ethical dimension of teacher's subject knowledge which is full of meaning for them and reflects the purpose that underpins their professional practice. I conclude the paper by considering how these findings can be developed in initial teacher education and used to strengthen geography teacher preparation. In particular I highlight how different models of initial teacher education can enable such an understanding to develop.



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**Using Modified Problem-based Learning: a pedagogy to prepare geography student-teacher**

*Tammy KWAN (China (Hong Kong))*

The use of PBL in many classical disciplines, like Medicine, Dentistry, Nursing, Speech and Hearing Sciences, has formed a rather mainstream approach and pedagogy. However the use of PBL in teacher education still appears to be uncertain and perhaps even unwelcome by many teacher educators and teachers. This paper shares my way of using PBL as a pedagogy to structure part of my PGDE Geography Major Method Course to engage my geography student-teachers to go through professional learning to do their teaching practicum in schools. Instead of using the classical seven jumps PBL model, a modified problem-based learning is used as a learner empowered approach to dissect and analyse authentic geography scenarios and lesson videos to reveal understanding of key issues that student-teachers need to acquire by linking relevant educational theories with teaching practices. The objective of the PBL analysis on scenarios and authentic lessons is to empower student-teachers' self-directed preparatory learning and the group collaborative discussion through the use of the modified PBL to diagnose good and meaningful practices in lesson teaching with the intention to actualize the rationale of education reform they have to face. The results appear to be successful as the student-teachers perform with greater competence and confidence during the subsequent four-week school experience. Mentor-teachers are happy with their planning and teaching though they are only 'trained' in just under two months of their initial teacher education programme.



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## Activity technologies in school geographical education (from experience of an experimental platform of Moscow State Pedagogical University)

*Elena TAMOZHNIAIA, Elena BELOVOLOVA (Russian Federation)*

The article is dedicated to experiment of a scientific and practical platform of the Moscow Pedagogical State University on a problem of realization of activity approach in school geographical education. On the basis of the analysis of modern requirements to results of training the methodical system is designed. As the most important component of system the technological component directed on new creation of the educational environment acts. Activity of the pupil acts as a basis of improvement of technology. The analysis of new types of educational activity is offered. Features of modern pedagogical technologies, their interactive properties are characterized. The special attention is paid to technology of design and research activity, to modular technology, case-stady technology, to communicative and dialogue and information and communication technologies. On the example of work of experimental schools new forms, methods and means of the organization of school geographical education are offered. The necessary conditions of teachers professional get ready are the main practice methodological competency and methodological mentality. Up to date the main principals, theoretical and practical methods of teachers training are submitted for consideretion. The main forms of teaching, methods of forming and training of methodological knowledge and abilities, methods of checking the effectiveness and quality of teaching activity are described in the article.



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## Educational Field Trips are Alive and Well: The Contemporary Learning Environment

*Yael SNEH (Israel)*

Rationale: In the Internet era, in which digital, computerized, online, and filmed means of teaching are the norm, it seems that it is not "yet" possible to create direct interaction between learners and the environment based on screens and within four walls. One of the goals of the field trip is precisely that – a dialogue with the environment. "Teaching the Educational Field Trip," a course that has been taught for about 20 years in the Department of Geography and Environmental Studies at Oranim Academic College, offers students the opportunity to learn many concepts, skills and ideas included in the curricula of geography and other disciplines that cannot be demonstrated through classroom experiences, but only in their natural environment, i.e., in the learning environment outside the classroom. There, learners encounter holistic reality reflecting a multidisciplinary dimension. They are also exposed to concrete demonstrations that can overcome the limitations of the classroom in dealing with abstract, verbal and current phenomena. Methodology and Findings: The research is based on analysis of feedback, initiatives and activities created by the learners themselves, and a diagnosis of the results of their work in the field and in writing. The research shows highly significant achievements, including familiarization with values such as the connection between human beings and the environment, while developing personal awareness and responsibility for environmental protection, mapping learning stations and creating connections between the substance of the field trip and the curriculum, developing systemic thinking, demonstrating the connection between science and technology at the social and cultural levels, familiarization with settled sites in urban environments, industrial plants and shopping malls as suitable locations for educational activities, and identifying the link between modern consumer culture and the current form of urban living. In the lecture, we will present examples from the experiences accumulated by teaching candidates during independent educational field trips, and the students' feelings about their experiences with environmental education, learning outside the classroom, cultural events, and recreational activities, the goal being their application in teaching in the field. All of this is meant to serve as an answer to the students' passive sitting in front of the television and computer screens. Conclusion: At the end of the course, students go on an educational field trip of their choosing and present its unique characteristics. What is particularly interesting is the way the learners expose current reality and how they authentically experience each and every site. It should be noted that, in their feedback, students stressed the added values of the course: acquiring knowledge of skills to teach in learning environments outside the classroom, and improved self-confidence. They also stated that, practically speaking, this course contributed the most to their studies, and as a result, they feel equipped with an appropriate toolkit with which to continue their journey. Key words: educational field trip, learning outside the classroom, mapping stations, field trip pedagogy, human being and the environment.



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## Doing Geography: The Role of the Body in Singapore Pre-Service Teachers' Subject Conceptions and Practice

*Tricia SEOW (Singapore)*

Teachers' subject conceptions and its relationship to their identity and practice have been a focus of research within geography education research. However this literature tends to frame conceptions mainly in terms of cognition, ignoring the role of the body within teachers' conceptions of geography, as well as of "good" teachers (Moore, 2004) of geography. bell hooks (1994), for example, cautions against the Cartesian notion that there is a 'split between the body and the mind', leading to the belief that in classroom teaching 'only the mind is present, and not the body' (1994: 17).This paper draws upon Foucauldian notions of discursive power operating in society through disciplining the body (1980, 1991) to examine the ways in which bodies are implicated in six Singapore pre-service teachers' understandings of geography and geography teaching. The data gathered from concept maps, elicitation devices and indepth interviews suggested that respondents' drew upon separate sets of discourses when discussing the bodies of "good" geographers versus "good" geography teachers. In fact discourses in the subject context were important to respondents' conceptions of geography and geographers' bodies and practice, but these were less important in discussions of geography teachers' bodies and the work they do in schools. This split in pre-service teachers' conceptions of the bodies that do geography also mirrored a larger divergence in their subject conceptions of geography at school and academic levels.



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## An Assessment of the Beginning Teachers' Conceptions of Fieldwork in Geography in Singapore

*Geok Chin Ivy TAN, Qiu Fen Jade CHEN (Singapore)*

The new secondary and junior college geography syllabuses in Singapore prominently recommend the inquiry-based approach for the teaching and learning of Geography. The other salient feature of the new syllabuses is the introduction of geographical investigation in fieldwork as a component in the examinations for both lower and upper secondary. Therefore, conducting fieldwork for students is now necessary and essential. This present qualitative study seeks to explore the conceptions and experiences of fieldwork of beginning teachers who have transited into teaching formally in schools. Through an online survey questionnaire, these beginning teachers were asked questions in the attempt to understand the complex processes and challenges that they face when they plan and conduct fieldwork for their students. The questionnaire comprised of 18 questions divided within three sections. The first section was to gather the demographics. The second section focused mainly on seeking the beginning teachers' experiences of and in fieldwork. The final section sought to understand more about the beginning teachers' conceptions and opinions on the use of the geographical inquiry method in fieldwork. The results indicated a unanimous belief among the beginning teachers in the value of fieldwork for its learning benefits and irrefutable place in the discipline of Geography despite having to work around challenging situations on the ground. Having had conducted fieldwork on their own, the beginning teachers reflected on the fieldwork skills they could improve on. The beginning teachers also expressed concern at the potential ramifications that the current compulsory fieldwork component in school examinations will bring. These reflections by the beginning teachers serve as an important feedback to curriculum planning purposes for the initial teaching training programme, and the provision of in-service professional development courses to support the teachers as well as to overcome the challenges they have while conducting fieldwork in schools.



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## Teachers as curriculum leaders: a GeoCapabilities Approach

*Karl DONERT (United Kingdom)*

GeoCapabilities is an EU-funded project which aims to improve the quality of teacher education and training by providing teacher support for dealing with complex issues in geography. Quality learning and teaching implies sound content knowledge, pedagogic awareness and knowledge of the students being taught. To be successful, teachers need to be effective 'curriculum makers' and therefore leaders in curriculum development. The project will produce materials and a conceptual framework for curriculum thinking in geography. This is different from and yet complementary to 'competence-based' curricula. The capabilities approach ensures educational aims are clearly in sight. Geo-capabilities ensures that geographical knowledge underpins curriculum making efforts. In short, the project will support and helps develop progressive knowledge-led curriculum making in geography. This presentation will examine the developments taking place in the project, the plans to support teachers and review progress made with the teacher support platform and course materials.



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## The Transmedia Storytelling in teaching Geography: the case of the "Transmedia Storytelling Project Carioca Traffic"

*Yan NAVARRO (Brazil)*

This article analyses the "Projeto Transmídia Trânsito Carioca" (Transmedia Storytelling Project Carioca Traffic), developed by the "Center for Audiovisual Studies and Research and Research in Geography" (NEPAG) in the "Colégio Pedro II" (Pedro II Highschool) Campus Realengo II located in the Rio de Janeiro, one of the most traditional institutions of brazilian elementary and secundary education. The project started to be developed in 2012 from readings and discussions in my PhD. The choice of theme related to urban mobility was made jointly with students who composes the NEPAG. After the choice of the theme we decided to produce content created collaboratively by students who compose the NEPAG, and among those contents was produced a film that deals about urban mobility entitled "Maravilhoso Caos" ("Wonderful Chaos"), photos, stories, podcast, scientific articles, games online and HQ. All these contents are interrelated in order to improve understanding of issues related to urban mobility in the city of Rio de Janeiro. The project has reached the following results: all members students obtained high academic achievement and develop technical skills that helped them understand other disciplines than geography; introverts students overcame their shyness and were recognized by the others students that integrates NEAPG as project highlights throughout its construction, the students developed autonomy to create their own audiovisual productions outside the NEPAG; other students in the school and beyond used the materials produced to learn about the various aspects of urban mobility. The project was the winner of the Urban Mobility Award in 2014, the most important on the subject in Brazil, in the education category.



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## Teachers envisioning future geography education at their schools

*Tine BÉNEKER, Hans PALINGS (The Netherlands)*

One of the challenges of a geography teacher education program is how to prepare teachers on their leading roles in keeping geography education relevant for young people in the 21st century society. In our master course at Fontys University geography teachers write an essay, based on literature and practical research, about the ideal situation of geography education at their schools in five year time. We analysed these essays in order to understand the preferable future images teachers have about geography education. Most of the teachers have innovative ideas regarding classroom practice, how to stimulate the learning of their students, and how to make the geography classes more interesting for them. They feel responsible for the learning of their students. Moreover by using curriculum models of Lambert & Morgan (2011) and Thijs & van den Akker (2009) we were able to analyse the nature of 'curriculum making' the teachers propose in their essays. We conclude that teachers have promising ideas about improving geography education but that they have difficulties to reason from a specific vision on geography education and to make a balanced proposal using the different elements of curriculum making, such as aims, content, learning activities and assessment.



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## GIS technology in geograchical education

*Anna ALEXANDROVA (Russian Federation)*

GIS technology in Russia, as in the rest of the world, is becoming more and more popular, and every day more and more people use it in their daily lives and professional activities, which in turn serves as a great motivation for its grasping by modern school students. The value of GIS is mainly in the development of spatial thinking – one of the main goals set by school geography. In addition, the use of GIS contributes to the development of such metasubject skills, such as: use of a variety of computer technologies and the Internet, analysis and assessment of objects and phenomena, comparison of data, choosing tools to execute a specific task, etc. GIS have great potential for geography education and may be applicable in a wide range of activities. From simple practical assignments to full-scale research projects – our experience has proven the effectiveness of the use of GIS technology in the classroom as well as in extracurricular activities. In recent years we have managed to diversify the methods and forms of application of GIS in geography teaching. Among the variety of GIS existing today careful selection is required in order to apply them in educational activities with students of secondary school age. This requires the development of specific criteria that would reflect not only the suitability of GIS for students with their particularities and capabilities, but also the feasibility of their use within the school geography program, and in accordance with the new government educational standards.



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## From Space to Schools – A Learning Portal on Earth Observation from the ISS

*Andreas RIENOW, Sascha HEINEMANN, Gunter MENZ (Germany)*

From May to November 2014 the Astronaut Alexander Gerst fascinated the German public with his live-impressions from the ISS. During his mission "Blue Dot" he used twitter and social media to enable his view on our planet for everybody. Simultaneously, the project "Columbus Eye – Live-Imagery from the ISS in Schools" published a learning portal on earth observation from the ISS. It makes use of the High Definition Earth Viewing (HDEV) experiment where four cameras observing the earth permanently. "Columbus Eye" makes the HDEV live stream publicly available on www.columbuseye.uni-bonn.de. Furthermore, it contains an archive with highlights from the HDEV experiment, for example spectacular views from the Mediterranean Sea, the Himalaya and sunrises. What is more important is the observatory within the learning platform. Here, it is possible for pupils and teachers not only to watch the videos but also to learn about the pattern, processes and phenomena of the coupled human-environment system. In addition, the pupils can act as researchers and conduct easy-to-use image processing analyses. The presentation explains the didactical and technical background of the project and how pupils can be taught the geospatial methods and technologies in an interactive and independent manner by enabling them to discover the earth from an astronaut's view.



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## The power of maps – empowering children through geomedia

*Inga GRYL (Germany)*

By this time, we live in a 'geomedialized' society: Technologies such as mobile devices, GPS and the omnipresent web allow to geolocalize data and information we consume to navigate our everyday lives, to be prepared for everyday decision-making, and to orient ourselves in a complex world. We constantly experience an additional layer of information on our subjective and shared perception of spaces. Additionally, neogeography allows laypersons to add own geoinformation to this system. However, the conditions of data production, data marketing, and the power relations linked to current geomedia are seldom obvious. Have maps (as visually focused traditional form of geomedia) ever since been tools of the exercise of power, nowadays geomedia seem to be even more powerful and influential concerning daily routines. Therefore, the Spatial Citizenship approach suggests a reflexive respectively critical attitude towards geomedia, as well as each citizen's ability to use geomedia (with simple web mapping tools) as effective tools of communication, interest negotiation, and participation. While this approach has been successfully tested in secondary and postsecondary education, the question needs to be asked where this process could start: How can children be prepared to life maturely in a geomedialized world, and: Can they become or even be Spatial Citizens? Ongoing from the rather cartography-oriented canism/can'tianism debate in geography education – children can/cannot handle maps – this paper draws the focus on the children's factual opportunities concerning the highly changed conditions, demands, and conventions of current geomedia and mapping. This presentations sums up theoretical insights from children as citizens to social spaces of childhood, and adds results from several small-scale, but essential studies conducted at University of Duisburg-Essen that will provide insight in how children can become Spatial Citzens, and in what respect they are already such.



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## Spatial thinking and smart city learning with GIS in secondary education

*Rafael GONZÁLEZ (Spain)*

The new geographic information technologies pose enormous advantages for teaching and learning of geography in Secondary Education. Despite their low status in the Spanish curriculum and textbooks, their use is growing by teachers of Geography in high schools of Spain, what contributes to improve Geography teacher education and increase Geography education research. The didactical experience will demonstrate the effectiveness of geospatial technologies -ArcGIS online-, not just for school learning of a scientific discipline such as the geography, but also especially for the development of spatial thinking and spatial citizenship. Through the application of active learning methodologies, as Inquiry-based learning, students have acquired skills of obtaining, organizing, analyzing and communicating geographic information based on smart city data and smart city topics. This paper details the urban space learning experience of a group of students of Geography (15 year old) and shows the outcomes by measuring the degree of acquisition of spatial thinking after the learning process, but also the capacity of communicating geographic information through the dissemination of school work.



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## GNSS Reference Stations of Lomonosov MSU Faculty of Geography

*Alexander SUCHILIN (Russian Federation)*

The faculty is a leader among departments of MSU for implementation of the latest scientific and technological methods of GNSS in educational and scientific process. During first year of study, on seminars and topographic practice, students acquire the skills how to work with modern methods of measurements of the Earth's surface. Learned skills are used by students in different thematic courses of general geographic practice. Using a GNSS mobile complex , quickly get altitude-horizontal coordinates of the object relatively to the reference station GNSS, in various shooting modes (static or kinematic), for example: • planning and measurement of reference points, with making of a plan / map of explored area; • areal leveling to identify forms of microrelief; • longitudinal and cross profiling of rivers bottom lands and ravines; • the underlying surface profiling of rivers and lakes (with echo-sounder); • Morphological shooting of geographical landscape parts (tracts and facies); • fixing local boundaries of the phenomenon; • the coordinates fixing of microclimate measurement points parameters. Purpose of reference station - to provide differential corrections for users of mobile systems GNSS in training or scientific research (for example, profiling, relief shooting, site exploration planning, local or areal measurements of natural phenomenas, etc.), which allows centimeter accuracy of objects measurements. Faculty reference stations simultaneous coverage extends in a south-west direction from Sergiev Posad to Kaluga, allowing to make researches on large areas at any time of a day and year. Station antenna receives signals from "GLONASS/GPS» satellite groups, with the ability to connect to the European system «Gallileo» and Chinese «Beidou». Station's hardware is made from Swiss company «Leica GeoSystems» modules. Accumulated navigation data stores on the server in a ZIP-files with open format «Rinex». Students and faculty employees have access to these files through Internet. Radius of station coverage in real-time (RTC), if the mobile complex equipped with radio or GSM modem, up to 40 km, which allows to the user receive amendments directly on research site, visualize measured objects on the screen of the mobile complex, background of which can serve aerophotoshoot or topographic map. In the post-processing mode, the user can be in a radius of 80 km from the reference station and carry out the necessary field measurements with mobile complex in offline mode. Back at the office, you need to request reference station stored data of field research from the server, equalize the field measurements data using software to reference station accumulated data and obtain the spatial coordinates of research object with high accuracy. Optionally, the measurements equalization can be performed using only data from one of the two satellites groups - GLONASS or GPS. The results can be exported into any known or local coordinate system (CS), to obtain local grid coordinates swich parameters of selected CS must be set. In addition, the results can be quickly integrated into project's geoinformation part. As part of reference stations GNSS network development, it is planned to establish new stations on bases in Krasnovidovo and Tregubova (Moscow Region), Kirov (Murmansk region) and Azau (Kabardino-Balkaria) that greatly expand the territory coverage of their use in geographical research.



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## GeoMobiel: an opportunity to integrate geo-ict in secondary schools in Flanders?

*An STEEGEN, Jeroen STIERS, Lieselot LAPON, Bart DE WIT, Koen DE MUNTER, Philippe DE MAEYER, Frank CANTERS (Belgium)*

In Flanders an interuniversity project, GeoMobiel, was set up for secondary school students as GIS is poorly integrated in the normal geography curriculum of those students. The project is aimed at students of 16 to 18 years old with some background in mathematics, sciences or technology. The main goal of the project is to bring students in touch with disciplines such as geomatics, GIS, cartography, and with the possibilities they offer for entrepreneurship. A geolaboratory with equipment such as laptops, level instruments and GPS goes to schools and offers 4 modules of 4 hours each from which teachers can choose. In the period September 2014 till June 2015, approximately 6000 students are reached in almost 100 Flemish secondary schools. Every student, as well as every teacher, who participate in GeoMobiel has to fill in a questionnare in order to evaluate the project. The evaluation of the project is positive: as well teachers as students enjoy the content of the modules and indicate that new knowledge and skills are learned. 10% of the students also indicate they consider to choose for a geo-ict related study in higher education, which suggests that it is important to integrate GIS in the obliged geography curriculum. Therefore, GeoMobiel can be seen as a possibility to integrate geo-ict in schools. However, finance for this project is only temporarily and teachers are a bit reluctant to integrate GIS themselves. But there might be funding on the European or international level?



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## Current issues of the GIS and Remote Sensing in the Secondary school of Mongolia

*Bat-Erdene TSEDEV, Ser-Od TSEDEVDORJ, Enkhjargal PUREVSUREN, Uranchimeg GETSEL, Amgalan AVHINSUKH (Mongolia)*

Remote sensing is a rapidly growing technology and is one important in the satellite research. This is always viewed as a discipline that is integrated with other disciplines such as Photogrammetry, GIS and computer science. In 2009, the description of GIS and Remote Sensing was firstly established in textbooks of Mongolian high school. In addition, this paper is focused on how it established on the textbook or curriculum of high school and how to improve it. This paper aimed to determine the problem and reason which are rising from this and to compare context in textbooks. According to the study, it is revealed that the authors of textbooks more concentrated on giving theoretical general concept of GIS and Remote Sensing and also provide exercises related to observing changes of cloudiness on the satellite image and to work process on the Google Earth software. The exercisesusing Quantum GIS open source software were added newly in textbook 2012. Therefore, the assignments using Mongolian GIS and Remote Sensing method were added in textbook in the last years. These assignments were more interesting and beneficial for students. For example, analysis guidelines exemplified by a forest database that how analyze to access to Mongolian Environmental database, National Environmental database center and World Wildlife Fund.This study determined the advantages and disadvantages and the way of development, geospatial technologies, to stimulate geographical thinking and how to improve geospatial skills based on questionnaires which was taken from 30 teachers and 200 students of high school in Mongolia.



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## Understanding the Earth with Satellite Images – Development of an Adaptive Learning Platform for the Application of Remote Sensing in Schools

*Kathrin VIEHRIG, Vera FUCHSGRUBER, Nils WOLF, Alexander SIEGMUND (Switzerland)*

Due to its presumed educational potential and its ubiquity in everyday life, remote sensing has been included into many curricula in Germany. Its integration into everyday school practice is still hesitant, partly due to the complexity and often time-intensiveness of the analysis of satellite and aerial images. Against this background, a web-based learning platform for computers and tablets is developed within the project "Space4Geography". On this platform, students can examine geographic questions using original, high-resolution satellite imagery. Geographic topics are selected based on an analysis of the curricula of Germany's federal states in order to make the platform usable nationwide. The platform is adaptive, enabling the customization of content and level of difficulty depending on the student's competencies. The data basis consists of 50 RapidEye-Scenes and 15 TerraSAR-X-Scenes. The images are processed and analyzed with the help of the web-based remote sensing software "BLIF". To ensure the applicability for teachers and students, the platform development is accompanied by Educational Design Research. The approach seeks stronger connection of educational research and school practice by integrating experts' and users' suggestions in all phases of the development. In the design phase, an online-survey is carried out to be answered by students, teachers and researchers in the fields of geography and geography education. The results will influence the conception and development of the platform. The prototype of the platform will be completed in autumn 2015 and will be evaluated and developed further in several cycles until the end of 2016. The concept of the project and a draft module will be presented, highlighting issues in generating adaptive learning paths.



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## MAP, MAP USE and MAP DESIGN: An Evaluation in Turkey

*Ilkay BUGDAYCI, Ibrahim Oztug BILDIRICI (Turkey)*

Maps are one of the most useful and crucial communication tools that have been used for many themes in order to make decisions, interpretations about geographic reality. Maps enable pupils to learn more details about spatial objects, environment and relationships permanently because of being visual. Pupils will be able to transfer and process spatial data on maps, to find location, to distinguish different types of maps, to perceive spatial distribution, to interpret maps correctly, and to create sketch maps. For this reason maps must be designed carefully especially for pupils. Cartographers have important responsibilities in the field of map use and map design in education. The more successfully cartographic design, the more maps can be used effectively. The design of sign, font, color, graphical representation, legend must be appropriate for the child's age depends on the perception and level of education. There are many maps that are published without control of the cartography experts and children specialist, regarding geographical and historical themes in social study course books. But in recent years positive changes can be seen with current maps in social studies course books. In this study, the changes in recent years in our country about maps, map use and map design will be evaluated. Then, deficiencies will be determined and some suggestions will be given. Additionally, a comparison are going to be made between developed countries and our country, on which age and how map concepts are taught to pupils. Additionally, an algorithm that involves the cognitive development of a child about map use will be described.



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## GIS in teaching geography

*George NIZHARADZE (Russian Federation)*

GIS in teaching geography. The Russian Federation since 2010 implements new approaches in education displayed in the new «Federal State Education Standard» (F.S.E.S.). The basis of the provisions of the F.S.E.S. is to develop universal educational activities. Together with the implementation of the provisions of the F.S.E.S. changed qualification requirements for teachers of geography, where considerable space is devoted to the formation of information and communication competence of the teacher. To achieve the goals of the F.S.E.S. in teaching geography implemented GIS «Live geography» (GIS L.G.). GIS L.G. can help learners of all ages understand the world around them. GIS L.G. helps students and educators engage in studies that promote critical thinking, integrated learning, and multiple intelligences at any grade. GIS L.V. has tools for creating and editing digital maps, measurement and calculation of distances and areas, construction of 3D-models, remote sensing data processing, such as digital satellite images, as well as tools for working with databases. The thematic content of the maps created in the tradition of teaching geography in Russia for first, middle and high school. The program is used in related disciplines since Earth Science and Social. Presentation includes examples of lessons and projects developed using GIS.



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## Augmented Reality (AR) Information System for Geography Education

*Ysohiasyu IDA, Satoru ITOH, Hiroaki AKIMOTO, Yoshihiro UGAWA, Aya FUKUCHI, Jun TSUTSUMI (Japan)*

This presentations related to geography education focusing on the application of Augmented Reality (AR). AR is a view of real-world environment whose elements are augmented by computer-aided input such as camera image and GPS data. Augmentation is conventionally in real time and in a semantic context with environmental elements, such as detailed explanation of old temples during the field test. With the help of AR, artificial and additional information about the surroundings of a test subject can be overlaid on the real view. In the presentation, we report the specification and evaluation the AR information system we have developed for geography education. The evaluation was made by the practice of using the system in upper secondary school and university classes. As a result of the practice, interest in geography of students increased and their geographical skills such as the map utilization were improved.



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## The Introduction of Use of Statistics in Education (I-Use): the case of Use of Statistics in the Geography Curriculum

*Luc ZWARTJES (Belgium), Karl DONERT (United Kingdom), Aikaterina KLONARI*

There is an increasing importance of statistical literacy for everyday life, almost every economic and scientific activity in the modern world relies on statistical information in one way or another. It plays a prominent role in business and industry, aspects of government and scientific and economic progress. The over-abundance of information poses serious questions, for example what degree of statistical literacy should we expect for every pupil? How can we structure opportunities to enable students to reach this level and to ensure that teachers have sufficient skills to be able to use statistics to improve their teaching? The dilemma is that as more data and information becomes more readily available and the tools for presenting and analysing the statistics become more sophisticated, the ability to introduce and integrate statistical information and undertake analyses is not matched by educators' capacity to use the information, tools and technologies productively. The I-Use consortium investigated the use of statistics in a.o. the geography curricula of the participating countries. Statistical education is not a separate subject at either primary or secondary school level in Europe. It appears that statistics, when present in the curriculum, is universally included within mathematics. There is a general tendency to teach statistical concepts (in mathematics) at very early ages in many countries; in some, six year-old children start studying basic statistical concepts and continue to develop these concepts in all the curricular levels until secondary school Statistics appear mostly in the curricula of mathematics (where it is a separate item) and in history, although the statistics as a source for real investigation is mostly denied. The objective of I-Use is to focus on teaching and learning activities considered necessary for the professional development of teachers. Thus they can support their students in becoming statistically literate people, capable of reasoning from and about information and making informed decisions based on quantitative information. Therefor I-Use developed ready made lesson materials and a toolbox to easily create own statistics. I-USE will also deal with the assessment of student learning making the distinction between assessment of learning (summative) and assessment for learning (formative) approaches. This will be addressed through three basic components, cognition, observation and interpretation that underlie all forms of evaluation.



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## What do undergraduate students think of the use of Virtual Field Trips in geography education?

*Martens LOTTE, A. STEEGEN, G. VERSTRAETEN (Belgium)*

The development of online geographical databases and tools offers many new opportunities to study geographical themes and regions without traditional fieldwork, or to complement existing field-based learning activities. One example of the use of geospatial ICT in geography education is the development of Virtual Field Trips (VFTs), for example in Google EarthTM . In this study we questioned whether VFTs contribute to an interactive learning environment that provide students with better insights in the horizontal and vertical relationships between the spatially varying topics under study. Therefore different VFTs were developed and tested by undergraduate geography students. First, a VFT was developed as a post processing tool of a field trip. Secondly, students had to create their own VFT by integrating photographs, GPS-tracks, literature and other spatial information. Results confirm that students are positive about the use of VFTs. Students indicate that the VFT improved their mental map of the study area. Moreover, VFTs help students to study and structure the learning content of the traditional fieldtrip and to stimulate their spatial awareness. Our study also pointed out that VFTs should not be restricted to physical geography themes, but that human geography topics can be covered as well, despite the fact that in literature very few examples are described. However, depending on the topic, other ICT tools need to be considered. Students indicate, for instance, that Google StreetviewTM has a higher added value for human geography related themes. The main concern with VFTs is that students needed much time to use or develop a VFT. The study also shows that students do not often create a VFT spontaneously, but only when this is a compulsory activity within a course.



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**Use of the computational-informational web-GIS for the development of climatology students' skills in modeling and monitoring of climate change**

*Yulia GORDOVA, Yu. V. MARTYNOVA, T. M. SHULGINA, E. P. GORDOV (Russian Federation)*

The current situation with training of specialists in environmental sciences is complicated by the fact that the very scientific field is experiencing a period of rapid development. Global change has caused development of measurement techniques and modeling of environmental characteristics, accompanied by the improvement of conceptual and mathematical apparatus. Available training programs in environmental sciences disciplines do not have time to adapt to such rapid changes in the domain content. The presentation is devoted to results of the use of computational-informational web-GIS "Climate" (http://climate.scert.ru/) to train future specialists in geosciences. This information-computational Web GIS aimed at monitoring and analysis of ongoing and future regional climate changes provides key elements of thematic Virtual Research Environment (VRE) and serves as a prototype of a Virtual Learning Laboratory (VLL) for hands-on learning at Tomsk State University. In the framework of this VLL several laboratory practices are developed (e.g. "Analysis of the future climate", "Analysis of regional climate changes"). The main feature of described practices is that a connection of the educational block with elements of "Climate" system software allows to perform computational laboratory works using information-computational tools of the system and improve students skills of their usage simultaneously with mastering the subject.



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## La formation géographique des écoliers à l'Université de Moscou

*Marina ARSHINOVA, Natalia ALEXEENKO, Marina KORSHUNOVA, Valery ALEXEENKO (Russian Federation)*

La faculté de géographie a une grande expérience d'élaboration des matériaux méthodique et pratique pour apprendre aux élèves d'école secondaire (classes terminales) disciplines différentes avec l'accent écologique. Les meilleurs professeurs et scientifique de la faculté ont élaboré les cours sur ce sujet. L'École "Le Monde de Géographie" est un analogue de l'École de Géographes Jeunes auprès de la fac de géographie de l'Université. Elle propose un enseignement par correspondance qui permette les élèves de n'importe quelle régions de la Russie, recevoir des renseignements supplémentaires au domaine de géographie. Problèmes généraux: * activation d'une composante géographique et écologique de la formation scolaire; * connaissance des branches spécifiques de géographie; * introduction des conceptions nouvelles sur l'enseigner de géographie; * réception d'expérience scientifique et pratique de résoudre des problèmes géographiques différents. Moyens pour réaliser: * exposition du point de vue contemporain sur la géographie et sur l'écologie pour former un homme moderne dans une conception de développement permanent; * interprétation les problèmes contemporains pour les écoliers sous une forme accessible; * utilisation le potentiel scientifique de professeurs de la faculté; * possibilité pour les élèves de communiquer directement avec des professeurs; * développement la capacité d'élèves utiliser les ressources interactives contemporains; * exécution des tâches laboratoires et pratiques et des travaux de cours; * participation de travail champêtre d'hiver et d'été; * réalisation du passage plus harmonieux d'école secondaire à l'école supérieure (conférence–tâche pratique–épreuve).



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## Geography and the Integrated Curriculum in Japanese Elementary school: In Case of Living Environment Studies

*Hyunjin KIM (Republic of Korea)*

The new integrated subject, Living Environment Studies (LES) replaced Social studies and Science at the first and second grades in 1989. This subject is devised for young students to be interested in relationships between themselves and local people, society and nature through concrete activities and experiences. Geography has a distinctive role to play in enabling children to explore and understand the natural and social environments in which they live. Therefore, LES includes many geographical contents. Although physical geography is nearly absent from Social Studies, but it is a main element of LES. In teaching and learning of LES, teachers should actively seek coordination with Moral Education and other subjects such as Japanese Language and Arts and Handicrafts. They should also provide students with opportunities to learn in outside the classroom positively. Exploration of the familiar area around school is a very effective means. Children observe and record change according to the four seasons in school ground and nearby park. They learn about the location and function of various local facilities, such as shopping center, police station, farm, and factory. They also have a chance to meet and communicate with local people. On-site experiences are very worth and important. Children find and feel something interesting in the field. Making and presentation of map is a good activity for children to describe and explain their findings and feelings. Exploration and mapping activities require geographical skills as well as literacy, creative expression and communication skills. Although LES take place through the integrated themes, geography is reflected in the organization of teaching and learning.



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## Development Of Integrated Programs In The Earth Science Museum At The Lomonosov Moscow State University

*Marina PIKULENKO, L.V. POPOVA, I.P. TARANETS (Russian Federation)*

New relationships between education and community declare the following: abolishing barriers between levels and areas, creation of open and flexible educational structures; taking into account the educational needs of individuals. Nowadays this integration in the field of education for sustainable development into all forms of education systems covers all learning levels from primary to tertiary, including vocational and adult learning. Today numerous integrated programs are successfully realized at the Lomonosov Moscow State University, particularly, at the Earth Sciences Museum. The multidisciplinary Museum which promotes scientific data in the fields of environmental education – Geography, Geology, Biology, Soil sciences, develops methodological and research work. Opportunities and materials for creation and organizing integrated lessons include the combination of geographical, biological, chemical and ecological data, subjects and visualization, exist and are developed for students of secondary schools at the Earth Sciences Museum. The prepared materials suggest information and methodical recommendations for teachers, for students, for teamwork and complex tests, for assessment of environmental awareness. Every year more than 16000 people take part in excursions, Science Festivals, environmental games, Ecology Olympiads, Ecology cases and summer schools at the Earth Science Museum. It's hard to imagine the modern development of all education levels from primary to tertiary, including vocational and adult learning without integrative cooperation museums with schools and other educational organizations in order to increase the learning motivation of students, to broaden their world outlook, to apply environmental knowledge in everyday life for our sustainable development.



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**Integrated Approaches in Tertiary Education: Geography in Classical University (Example: Peoples' Friendship University of Russia)**

*Veronika KHOLINA (Russian Federation)*

Geography is a discipline forming spatial thinking and principles of unity and interdependence of the natural and social environment at all educational levels, especially in tertiary education. Nevertheless standards recently adopted in Russia practically excluded geography from basic part (B1) of curricula for non-geographers (rare exceptions are bachelor programs "Regional Studies", "Customs Business", "Ecology"), but gave the possibility of including geography in variety part to all bachelor and master programs. It means that proposed courses should be practically oriented, interesting for students and closely connected with future job and basic part's subjects in all levels of education. This article analyzes the experience of Department of Regional Economics and Geography of the Peoples' Friendship University of Russia (classical University, established in 1960 to train students from developing countries, now more than 70 specialties on the 18 faculties and institutions) on the design of educational courses for all specialties of the University. The courses introduce the geography in the context of the real world's problems of modern science and everyday life. Practice-oriented tasks have several levels of difficulty. Particular attention is paid to the interactive methods of teaching in electronic textbook, project's work of students, development of their professional competencies, to the practical importance of the material for the future career.



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## Project "We Propose!": the challenge of local territorial citizenship

*Sérgio CLAUDINO, Rui SANTOS, Helena ESTEVES, Roberto MACHADO, Lana NASCIMENTO, Ivaine TONINI (Portugal)*

Since 2011/12, the Institute of Geography and Spatial Planning of the University of Lisbon and ESRI Portugal promote the "Project We Propose! Citizenship, Sustainability and Innovation in Geographic Education". In 2014/15, participate in the Project 35 schools across the country and more than 1,000 students, almost entirely of 16-17 years, attending Geography discipline in the 11th year of secondary school. The Projet it will be implemented in Brazil in 2015, by Federal University of Tocantins. In the 11th year, must do a Case Study. In the Project, the case study should be directed to the identification and resolution of specific territorial problems of their area. The project involves universities, schools, local authorities and businesses. We give great attention to cooperation with the Municipal Councils, who are asked to give account of the main concerns of the Master Plan and take into account the proposals made by the students. Students begin by identifying local problems (a building that is abandoned, a street that has walls, graffiti, a bus that has a path that just serves the population, a music school is lacking in the locality , etc.), select one of these problems, develop fieldwork and proposed solutions to the problem they research. All proposals made by the students are presented in the National Seminar at the University of Lisbon. This is the great portuguese project of experimental teaching of Geography. We clearly assume the challenge of local territorial citizenship.



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## Geography and multicultural education

*Alexander LOBZHANIDZE (Russian Federation)*

Russia is a unique cultural world, having experienced mutual inlfuence from Europe and Asia. As a result, the country has evolved to be multicultural and multi-confessional. In modern Russia, there are practically no regions with mono-ethnic composition of the population, therefore instead of focusing on their differences it is more productive to strive for the recognition of the similarities of their everyday life. Ethnocentrism in education presumes the right to freely meet the cultural needs of any individual, not only as part of a particular ethnic group, but also as part of other social entities. Modern geographical education should fully meet the needs of the global community in the formation of inter-ethnic understanding, and be an effective way to resolve ethnic and religious conflicts. The Declaration of multicultural education, adopted by the IGU, noted that "geographical education should promote understanding among diverse cultural groups in different areas." The growing interest in the ethno-cultural component of geography should be aimed at addressing a number of problems: -Developing the concept of integrity of humanity in its ethnic diversity, the complexity of ethnic problems; -Identifying the particularities of the location of major ethno-linguistic and religious groups, the centers of ethnic and religious conflicts; -Studying major historical and cultural areas, ethnic cultures, economic-cultural types in the country and the world; -Teaching methods of generalization and systematization of information in order to distinguish today's ethnic and cultural problems, predict inter-ethnic cooperation; -Educating creative, spiritual individuals who respect various cultures, exhibit intercultural interaction and tolerant behavior.



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## Humanistic paradigm in geography

*Alexander GLADKEY (Ukraine)*

Scientific investigations of the post-non-classical period are based on the concept of transition from disciplinary knowledge to the post-disciplinary humanistic one. Here are 4 main direction of humanization in geography: 1. From anthropocentrism to humaneness. Traditional anthropocentric concept in geographic investigations based on practical orientation of our science for most complete satisfaction of human needs. But geography can be involved into problems of humaneness and common-to-all-mankind values, rather than individual persons only. 2. From systemness to humanistic synergy. Most of geographic objects are considered as a complex and compound system. But, most elements of geographic space do not fit into traditional concept of the system. Systemic paradigm should be supplemented with new humanistic elements, which will provide an integral and non-formalized approach to investigation. 3. From quantitative methods to their further qualitative analysis and humanistic interpretation. The quantitative methods in geography lead to simplification of geographic reality, development of small-scale applied investigations that cannot reflect all the processes and phenomena in geographic space. These methods should be followed by synthesis, qualitative analysis and creative interpretation of the obtained results. 4. From territorial differentiation to philosophic fundamentals of global geospace. Geography should not be limited by narrow bounds of perception of spatial system and relations. The bounds of geography are much wider and essentially extend to generalized comprehension of philosophic fundamentals of global geospace. It is this statement that the close relations between geography and philosophy and humanities in post-disciplinary knowledge consist in.



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## Assessing systemic thinking in kindergarten and primary school using the topic '(renewable) energy' – empirical results and issues for the future

*Kathrin VIEHRIG, Alexander SIEGMUND (Switzerland)*

The topic 'energy' is explicitly included into the curriculum for primary school in the German federal state of Baden-Wurttemberg, and also has aspects relevant to the kindergarten orientation framework. It is also a topic that traditionally has been both part of geography education and other subjects such as physics. In early education, geography is usually not taught as an individual subject, but integrated together with science and social studies. This has consequences for assessment. Two interdisciplinary projects "Shaping the Future" (kindergarten) and its follow-up project "Sun is Life" (primary school) focus on the topic (renewable) energy. The projects consist of three working groups (I) teacher training, (II) development of learning material and mentoring secondary-school & kindergarten/primary school partnerships, and (III) development of an assessment instrument for kindergarten/ primary school students. The assessment instrument focuses on basic systemic thinking skills. After a brief overview of the projects, the results of the final quantitative study with kindergarten students will be presented, including sample items, the exploration of context dependencies and the discussion of selected issues related to assessing students who cannot read yet. Possible links between systemic thinking and pre-concept research will also be discussed. Finally, the first adaptation and extension of the quantitative instrument to primary school, including the results of a pilot study to be conducted in 2015, will be submitted to debate.



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## Possibilities of an international assessment in geography

*Theresa BOURKE, Rod LANE, John LIDSTONE (Australia)*

A recent editorial in International Research in Geographical and Environmental Education (IRGEE) (Stoltman, Lidstone & Kidman, 2014) highlighted an opportunity for the inclusion of other subjects in the Trends in International Mathematics and Science Study (TIMSS) tests. At present such tests only encompass mathematics and science. The editors encouraged geography educators to take the initiative and be proactive for an international assessment in geography to become a reality. This study investigates geography teacher educators' and geography professional associations' perceptions of such an international assessment in geography. In particular, this study is designed to collect participant views about: the benefits of developing an international assessment in Geography and having international data to inform curriculum, research, classroom practice and policy, any potential disadvantages of including Geography in TIMSS, and the knowledge and skills that should be targeted in such an assessment if constructed.



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## English language classes is an essential element in the preparation of Russia's team for International Geography Olympiads

*Irina OKS (Russian Federation)*

To be able to demonstrate their geographical knowledge and skills at International Geography Olympiads, participants not educated in English, must have profound knowledge of key geographical terms and be absolutely aware of geographical names. Since all tasks and related materials are written in English, it is essential to understand them properly and follow the instructions. Moreover, the Written Response Test also requires the ability of participants to express themselves cohesively in a foreign language. Besides, the Olympiad program includes poster presentations and a cultural function, where English proficiency is important, too. Thus, to properly prepare for International Geography Olympiads and demonstrate excellent performance, Russia's geography team receives intensive English language training during the "Big Week Outs" twice a year. This training takes the form of quests, quizzes, oral presentations, debates, essays, key terms learning, etc. Well, the general idea of this presentation is to share experience in preparing geography teams for International Olympiads and to get new ideas for future classes.



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# A Comparison of the Geography Content Standards for Middle Schools in China and the United States

*Fengtao GUO, Joseph P. STOLTMAN, Yushan DUAN (China (Beijing))*

The United States and China have national geography standards that identify the knowledge, concepts, principles, and skills that students should know and be able to use by the completion of middle school. This paper compares the geography standards of the two countries. In making the comparisons just the middle school content standards were used. Content analysis and concept mapping were used in the completion of the comparison.



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## The Introduction of Geography Content Standards in Germany: Using Q Methodology to Explore Teachers' Views of Standards

*Joseph P. STOLTMAN, Fengtao GUO (USA)*

National content standards have been a focus in many countries for the past two decades. In 2006 the German National Standards for Geography were implemented at the secondary school level and the adoption process was begun by Lander (State) educational authorities. The national standards clearly indicated the geography content that students should be taught, a task that had in prior times been within the decision-making authority of the classroom teacher as guided by national examinations. The new focus on content standards was becoming a Lander and national policy. This study used Q methodology to examine geography educators views of the standards and their effects on geography content and pedagogy in secondary schools.



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## A future for school geography in Flanders

*Luc ZWARTJES (Belgium)*

In recent years, the geographic educational world in Flanders was startled by plans that could lead to the (partial) reduction of the subject. Protests - which includes petitions at home and abroad - have partially reverse the trend. But this also has put the geographical world to think themselves. Instead of waiting for the reforms imposed on the geographical education, the geographical world should take the lead. We should dare to question ourself. Where do we want to go to with the geography education? What emphases do we want? How do we prove that we as a scientific subject really belong to the STEM subjects? For this exercise to we will conducted in the autumn in Belgium (during the Belgian Geographer Days) a debate with the participation of all agencies invloved, and where we also look at examples abroad. We want to hold the debate with the input of the administration, the academic world and the educational world. The goal is to create a manifesto on the scene for a future geography education in Flanders. A manifesto that should be used as basis for reforms in the educational curricula in Flanders.



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## Geography scholarship from classroom to the public intellect

*Lex CHALMERS (New Zealand)*

Geography scholarship from classroom to the public intellect Abstract The place of Geography in school curriculums of many countries is under threat, especially in comparison to disciplines like mathematics and science. We recognise, however, that there are important aspects of Geography that establish a core curriculum, and some international reference points that guide curriculum planners. The first substantive section of this paper explores use of the word 'Scholarship' to describe the best outcomes of teaching and learning in secondary education. Vocational options in Geography become more evident as a result of tertiary education; there are some common descriptors associated with scholarship in tertiary education systems, and frequent calls from professional associations in the discipline to build new and emerging scholarship into the practice of Geography. The scholarship of the geography professoriate is widely recognised and published, but its role in public practice and policy is not as obvious. The paper comments on the extent to which Geographers are recognised as 'public intellectuals'. Geographical examples are drawn from commentaries on the environmental transformation of some significant regions, through work on space economies and studies of population distributions to analyses of gendered spaces in urban design. The point of the essay is recognising that geography taught in primary and secondary schools is the platform from which we develop scholarship in the tertiary sector and ultimately academic geographers and public intellectuals who shape our societies. The argument is general, but the focus is on the pathways provided through Geography. In short, Geography contributes to lifelong education, but its provision of public benefit is less obvious.



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## Training teachers of geography and professional practice in Brazil and Portugal: relationship between university and school

*Maria Anezilany Gomes do NASCIMENTO (Brazil), Sérgio Claudino Loureiro NUNES (Portugal)*

This work aims to present a research doctorate in early about the training of geography teachers, in Brazil and in Portugal, through the relationship between school and university. The starting points of this research are: a) the approach and practice of Teaching Practice discipline, during the initial training, according to legal guidelines in both countries investigated; b) the institutional relation between the space of initial training (university) and the locus of professional practice (school); c) the design and development of the Institutional Scholarship Program Initiation to Teaching (PIBID) in the initial training of teachers of geography, in Brazil. The spatial area of research are the courses Geography of universities in the state of Ceará in Brazil and universities in Portugal. The first step is the analysis of the documents of the Ministries of Education on teacher training in geography in both countries, as well as the pedagogical projects of geography courses at universities. The analysis of the key research questions will be strengthened through information collection and surveys, procedures coupled with theoretical and conceptual references to support this research. Thus, we intend to contribute to the reflection on the triad: teacher - students in training - university professor and the triad: education - research - training in the construction of Geography and the teacher as agent of social action.



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## Comparative analysis of Higher Geographical Education in Russia and Europe

*Nina ALEKSEEVA, Oxana KLIMANOVA, Alexey NAUMOV (Russian Federation)*

The inventory was initiated by Russian Geographical Society and included the comparison of Geography and Environmental Science education at Russian and European universities. 54 universities in Russia have undergraduate programs and 26 universities have master programs on the majors "Geography", "Hydrometeorology", "Cartography and GIS". Another 140 universities deliver undergraduate and master programs in "Environmental Studies". The comparative study implied website analysis and visits to the selected universities and interviews with the academic staff. There were 28 respondents from 10 European countries. The survey included the following issues: place of geographical and environmental disciplines in higher education, curricula and teaching techniques within undergraduate and postgraduate programs, applied pedagogical means, interplay between theory and practice in education, role of fieldwork and laboratory work, GIS courses, organization of research-focused studies, etc. As compared to European universities Russian universities have higher proportion of compulsory courses (mathematics, physics, history, etc.), larger scope of physical geography at the first two years, and as a result smaller proportion of courses of GIS, analytical, statistical and other research methods. On the other hand, field studies in Russia are considered as the important component of teaching and two months of the curriculum are allocated each year for field courses. As a result of the study the recommendations for Russian educational community were elaborated to affect teaching of the discipline, enhance students recruitment, re-shape programs in response to global and national challenges.



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## Role of Urban Governance for Indian Cities

*Tapash BISWAS, Ashok Kumar SAHAY (India)*

The Inclusive Cities initiate the norms of good urban governance to promote equitable growth. Further phases of this initiative will involve greater capacity-building and networking, including growing collaboration and support from Habitat programme and partner initiatives. Promoting inclusiveness is not only socially just, but is good for growth and central to sustainable urban development. Inclusive urban governance means reduces inequality and social tension; incorporates the knowledge, productivity, social and physical capital of the poor and disadvantaged in city development; Increases local ownership of development processes and programmes. The authors propose a participatory design process based on three criteria: functionality (design that incorporates the needs of all types of individuals), context sensitivity (harmony with the surrounding environment), and equitable impact to "mitigate the social and human impacts especially on the most vulnerable members of society". Five quality dimensions in the concept of sustainable area development: social quality, environmental quality, economic quality, spatial quality and process quality. Combining the strengthening of environmental and nature values with enhancing the accessibility of rural areas and offering high quality job opportunities. Given the different aspects and interests this can only happen through a participative process, with all the stakeholders involved. Managing multi-functionality, multi-ownership and multi-stakeholders is considered as the key to the success of sustainability policies. Sustainability and inclusiveness need the involvement of all stakeholders. Public authorities traditionally had the leading role in land use planning. Sustainable development asks for combining different qualities and realizing synergy. Especially the creation of job opportunities in the urban fringe zone is an important issue.



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## An evaluation of serious games and real word data on student outcomes in university level geographic education

*Daniel ERVIN, David LOPEZ-CARR, Lumari PARDO-RODRIGUEZ (United States of America)*

In this project we evaluated the effects of two different techniques upon learning outcomes for geography students (n = 215) in a university setting. The experiment group participated in graded classroom and homework activities based around an online computer games, following the 'serious games' concept. They also completed an assignment using real-world data which they gathered from online databases. The control group of students was assigned more 'traditional' activities on the same subject matter, which did not involve gaming, gathering data, or the use of computers. The control and experiment groups were contrasted on their evaluation of the assignments difficulty, intellectual stimulation, enjoyment, and whether it prompted intellectual activity outside of the assigned work. Students were also contrasted on their graded performance on the laboratories, and relevant portions of the class examinations. Our analyses found significant differences in a number of these outcomes.



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## The Research of Board Games to Geography learning on Junior High School Students' Learning Motivation and Academic Achievement

*Hui CHIU (Taiwan)*

Lots of students study in Taiwan, they always worried about how to get good grades in test. They were used to recite to learn Geography. This purpose of the study is to compare traditional and Game-styled Teaching on junior high school. The method is that use board games in geography class and according participant observation and questionnaire to analyses student's learning motivation and academic achievement. This study is a reference for junior high school teachers who would like to integrate board games into geography curricula.



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**Initial teacher training and education geography: an experience with the PIBID in Ceara, Brazil**

*Maria Anezilany Gomes do NASCIMENTO (Brazil)*

In this present world where nothing stands still for any length of time, the education milieu in which geography is taught also needs to change as well as the teacher of geography. This professional needs to have a wide cognitive perspective to teach the young to examine such information critically and get them to sort out facts from opinion. However, the conceptual revolution in Geography has made little impact on schools in most parts of the world. In this context , this work analyses the initial training of geography teachers through the impacts of Institutional Scholarship Program Initiation to Teaching (PIBID) as a public policy of improving the quality of basic education in Brazil. This work aims to present an experience of Pibid in Ceará, Brazil through the Project " The school as a place of experience and learning: innovation and dissemination of methods of Teaching Geography" (State University of Ceará, in Limoeiro do Norte, Ceara, Brazil). Through this project, some methodologies and learning instruments, like mental maps, photographs, key questions, were developed in order to establish the dialogue among the social reality and the students. The use of a variety of approaches and methodologies such as "dialogue wheels" and fieldworks as "recognition walk" was fundamental to involve all the social actors - students, teachers, community - in exercises to knowledge of the territory. With this experience, some relationships between the theory and practise action and between the school and the university were significantly achieved.



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## Building a Research Coordination Network for Geography Education

*Michael SOLEM (United States of America)*

In 2013, National Geographic's Road Map for 21st Century Geography Education Project issued a research agenda for improvements in U.S. geography education. Although the Road Map Project identified remarkable examples of research and scholarship in geography education, its report made clear the field has long suffered from a lack of scientific approaches to educational research. Consequently, the geography education research literature is largely characterized by studies that are descriptive and anecdotal, with few examples of longitudinal studies and interdisciplinary approaches. Because of the historic absence of research collaboration and networking across multiple sites, information and data sharing among researchers has been minimal. Seeking to build research capacity and capability in geography education, the Association of American Geographers and Texas State University established a National Center for Research in Geography Education (NCRGE). The mission of NCRGE is to build capacity, coalitions and scholarly networks for broad-scale research in geography education. At present the NCRGE research coordination network includes researchers affiliated with 32 universities in the U.S. as well as leading geography education research centers based in the U.K., Singapore, China and Turkey. This paper will provide a progress report on the NCRGE, including an overview of current research projects and opportunities for international research collaborations in geography education.



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## Incorporating Place-based Education in Teaching Urbanism

*Huiwei CHEN, Roger CHAN, Yi SUN (China)*

It is assumed that a pedagogy without the proper acknowledgement of place may detach teaching and learning from context specific knowledge asset. This paper examines a pedagogy that involves Place-based Education (PBE) in teaching urbanism with a view to enhancing critical thinking aspect. The pedagogy is applied under common core curriculum in line with Hong Kong's 3-3-4 curricular reform. Students come from different disciplines who maintain various intellectual inclinations. The pedagogy chooses an angle of sustainable urban development which aims to explore how Hong Kong responses and reactions to a number of global issues related to sustainable urban living. Teaching and learning activities consist of lectures, group projects, video-screening and tutorials. A field exercise is incorporated with a view to bringing students to real urban scenarios. By reviewing students' submissions after the field work and feedbacks from the course evaluation, the pedagogy is benchmarked against the learning outcomes. The field trip as one pragmatic teaching and learning process accentuates physical engagement by students and collective ownership of place-based knowledge. Students' submissions demonstrate PBE is an effective way to position community to a real urban context, leading to a better recognition of the continuity and commonality of human experience across time and space. Also students are able to articulate site visit with knowledge obtained from lectures and tutorials, demonstrating the ability to synthesize different source of knowledge for reasoned positions. To incorporate PBE is an effective teaching practice whereby students are apt to maintain enduring pursuit of knowledge on urbanism and develop critical intellectual enquiry of related issues.



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## The Shanghai Model for Online Geography Education

*Osvaldo MUNIZ (United States of America)*

Even when it is widely recognized that higher education is a continuation of formal education received by students in primary and secondary schools, the diversity of parameters for higher education creates new challenges. Therefore, empirical and classroom research in geography education has to consider new factors. Among them, digital world integration and global awareness determine a range of variations. The increasing digital world integration shaped by the ICT revolution is diffusing with different intensities to all levels of geography education preparation. I have been studying how this integration could be managed to generate efficient online geography education for pre-service teachers. For the purpose of making an efficient digital integration between formal and informal education; learning environments well blended among students, I introduce what I call the Shanghai model for online geography education. The model is based on an applied procedure to allow geography education graduate students at East Normal China University discuss and propose solutions to national environmental problems with international implications. The model was developed in two phases with 16 graduate students. Phase 1 is the partial digital integration executed during a workshop in Shanghai. Phase 2 is the full digital integration through a platform and portal in the United States. Inquiry-based method IBL) and problem-based method (PBL) were combined for research purpose. Partial research results indicate that IBL and PBL give good results, yet imposes manageable restrictions.



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## System Competence in Geography Education - an empirically validated structure and stage model

*Rainer MEHREN, Armin REMPFLER, Eva Marie ULRICH-RIEDHAMMER, Janine BUCHHOLZ, Johannes HARTIG (Germany)*

Constituting a meta-cognitive strategy, systems thinking or system competence can only assume its assigned key function as a basic concept for the school subjects of geography and biology in Germany after a theoretical and empirical foundation has been established. A measuring tool is required which is suitable both for supporting students and for the evaluation of methodical-didactic measures. Such a tool is theoretically anchored in an empirically validated geography-didactic and/or cognition-psychological competence model, providing a differentiated representation of both the internal structure of a competency and the stages. The starting point of this foundation was the development of a normative-theoretically derived model for geographic system competence. Its empirical validation was performed in three phases aimed at operationalising the competence model by means of test problems. In order to analyse the factor structure of the theoretical model, various item response models were estimated. The item levels of difficulty expected in the competence model were related to the empirical levels of difficulty and predicted by means of OLS regression to verify the stage model. The two-dimensional competence model – with the two dimensions 'system organisation and behaviour' and 'system-adequate intention to act' – exhibits a better fit in reference to the model quality criteria than the one- dimensional and three-dimensional models. The correlation between the assumed graduation and empirical item difficulty is positive. Items that should be more difficult according to the competence model are actually shown to be more difficult in the trend. This means a valid and reliable measuring tool is available to diagnose and promote geographical system competence. It has to be implemented in practice as the next step.



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## Exploring children's perceptions of the environment

*Tomas TORBJÖRNSSON, Bryan WEE, Linda OLDEBRING (Sweden)*

The language children use when they talk about the environment opens a window into the societal norms and values that affect human – environmental relationship. To adapt environmental education to a specific cultural context thus requires knowledge about how the environment is defined within that context. This study investigates children´s perceptions of the environment in Sweden. In a geographical context it focuses our attention on children's sense of place, that is, how people inhabit spaces. In an educational context the objective of the study is to examine the different discourse(s) that emerges in children`s drawings, texts and talks about the environment. Specifically, we ask: what does the environment mean to children and what attachments, if any, do children have with the environment through their discourse about the environment? The research questions are focusing how the children visualize the present and the future environment in drawings and how they explain their drawings. Specifically, we ask: what does the environment mean to children and what attachments, if any, do children have with the environment? Drawings and interviews are used to elicit children's responses to these questions. Study participants consist of 35 children in year 6 drawn from a school in Stockholm. After establishing inter-rater reliability, we conduct content and thematic analysis of drawings as well as open coding of interviews to generate interpretive findings. Visual methodology and social constructivism are lenses that frame this study and validate children's sense of place. Implications for equity in geography and environmental education are discussed.



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## The Geo Future School

*Joop van der SCHEE (The Netherlands)*

The Geo Future School project is a challenging project focused on (talented) students being the new generation that needs to be prepared to think about how to solve future problems. Issues can be water, food, housing, transport, energy and sustainability. Students investigate local and global aspects of the major issues of our time in co-operation with companies and institutions in the region of their school. Other characteristics of this project are the use of Geo-ICT, fieldwork, international relations and interdisciplinary work. The output of the project are future oriented scenarios presented by the students. The 2014-2017 Geo Future School projects is EU funded. International teacher training sessions are included. The first results of these international training sessions are presented and discussed in this presentation.



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## Crowd Collaborative Geography Communities: A New Model in Informal Geography Education

*Osvaldo MUNIZ (United States of America)*

I envision crowd collaborative communities (CCC) and communities of practice (CP) as the communes that will help us to find strategies for new relationships between man and nature. Geography education and their practitioners have a golden opportunity to guide society as a whole in the process of redirecting the plan to occupy and use the Earth. Geography education communities of practice assisted by geospatial technologies (GST) should be encouraged to exercise a common global responsibility. CCC is the initial engine and source that geography educators should analyze to guide and prepare global citizens. The CCC was designed in the 1980s as an online crowdsourcing to deal with the generation of data for large and complex computing solutions. Today, the CCC experiences demonstrate the use of GST by thousand and even millions of participants to resolve geospatial problems. The original CCC has been transformed into a crowd collaborative geography community (CCGC); a more sophisticated CP that represents a massive number of worldwide participants who accumulate and reorganize knowledge by sharing geographic information in open sources. This new model is based upon non-formal guidance and informal self-learning processes performed by new global citizens who are participants of a CCGC. An andragogical environment of teaching and learning might be best suited for this purpose since a CCGC is mainly formed by adults who deal with problem-centered strategies.



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**Education and modern challenges: experience of the environmental management department**

*Alla PAKINA, Elena GOLUBEVA, Michail SLIPENCHUK (Russian Federation)*

Actual challenges, such as climate changes, loss of biodiversity, depletion of natural resources and other compex social and environmental issues that cause conflicts at local, regional and national levels require an innovative educational paradigm, capable to respond them. Classic geographic education, like no other, design an environmental world perception and form the foundation of education for sustainable development. Transition to the Bologna educational system entailed significant changes in the Russian High School, in particular a two-level system of students straining (bachelors and masters), and demanded revision of educational standards and curricula. Modern educational system at the Department of environmental management – both for bachelors and masters degrees – includes many training forms. It is a wide range of theoretical and practical knowledge, new research methods, such as GIS, remote sensing methods, and new skills in the field of environmental engineering, landscape planning, resources and energy efficiency, etc. Innovative forms are combined with traditional ones, such as lectures of leading specialists and field practices at different companies and institutions in Russia's regions.



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## Sharing knowledge via new technology

*Aya GREENFELD (Israel)*

Modern-day technology creates new opportunities in International geographical education by links and innovation. Through advanced technology and information, the implications of Engaging community to share knowledge of conservation heritage values is a vital to empower them ("knowledge is power"). The initial stage of the method proposed is to create a novel application to gather and collect information related to the needs and values of the community's conservation. As well as provide historical heritage targeted towards that community. The second stage analyzes the data and assembles a model heritage. The data will be divided into three groups: A. Awareness: the A group app information should inspire them to join in the discourse, and possibly to recruit more participants. B. Balance: the B group members may have varied perspectives of local heritage due to lack of knowledge. It is important to ensure that the app information is open and accessible to the group. C. Connecting: the C group app information should inspire them to create new ways to engage the community with their CBH. The last stage stage, engages and the community into the conservation process: education and awareness programs modified to the community. using the Suggested ABC method to ensure that different gropes in the community get the proper conservation information accordingly. Empowerment through conservation knowledge transfer using the ABC method suggested. Will creates a greater synergy between the community and their heritage will lead the community to congregate with shared knowledge of the past for future generations.



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## VISUAL LITERACY AND GEOGRAPHY TEXTBOOKS – EYE-TRACKING STUDY

*Yvonne BEHNKE (Germany)*

Modern Geography instruction is a subject that relies intensely on media. This paper addresses the challenges of learning with images, graphics and image-text combinations in Geography textbooks. It also examines in which form 'visual literacy' is relevant for teaching and learning with Geography textbooks. In the forefront is the question of how students link image and text information on a geography textbook spread in order to attain understanding of the content or to complete an assignment. Interdisciplinary observation methods are applied to connect aspects of Geography education and visual communication (communications theory, design) with aspects of text/image research. There is a close relationship between visual perception and eye movement. Eye Tracking as a visual method of data collection and analysis was used for precisely monitoring the eye movement. For example in which chronological order and with which intensity the test subject observes elements on a geography textbook spread and which areas are ignored. In a random sampling, 20 test subjects were tested. The test subject's eye movement was recorded while observing selected textbook spreads as well as while answering exemplary task questions taken from five contemporary Geography textbooks on identical topics. The eye tracking study revealed the students' difficulty processing information from complex image/text combinations. Based on the eye tracking documentation, the challenges facing learning with graphics and image/text combinations were elucidated and placed in relationship to educational psychology insights. The research results form the base for the development of design based strategies to improve students picture text comprehension, which could be applied in geography textbooks.



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## African Network for Geo-Education: Challenges and Perspectives

*Kholoud ABDELMAKSOUD, Abdelouahed LAGNAOUI (Egypt)*

The African Network for Geo-Education exists to develop a professional geoscientists and educators to provide geoscience outreach to all. ANGE established in the beginning of 2015, to enhance and spread the concept of Geo-education in Africa and Arab World. The aims of theAfrican Network for Geo-Education [ANGE] are to promote Geoscience Education in Africa and Arab World at diverse educational levels, to work for enhancement of the quality of geoscience education in Africa and Arabian World serve to encourage developments raising public awareness of geoscience, particularly amongst all people. The ANGE will be open on the international context, through cooperation with other organization that has the same goals to inmprove the quality of Geoscience Education an Africa and Middle East.Our goal is to achieve interconnected world by understanding fundamentals of our earth by involving geo-education both in-school and out school learning.The geological history of Earth from Archean to Quaternary is inscribed in Africa's rocks, which are very well exposed in fascinated geological landscapes, shaped by different orogenies, and are extremely varied. Many sedimentological, palaeontological, petrographical and structural witnesses of the history of Earth are of exceptional quality in Africa and many of these witnesses are unique, very educational and deserve to be preserved and presented to the students in a less academic and more widely accessible way. This geo diversity should be taking in consideration Our neglect of geo-education is having a bad effect. Some surveys and assessments show that the performance of African students lags behind the rest of the world in the subjects that contribute to a geo-education. They show that African and Arabian academics are not adequately preparing the young earth scientists for the global and environmental challenges of the modern world, and this is one of the great challenges faced the ANGE. We believe that it is time to make geo-education a national and regional priority, by paying more attention and allocating more resources to the components of geo-education. The quality of instructional materials and the availability of professional development opportunities for teachers in the geo-education subjects, also, we need to begin investing in African and Arabian countries at a level that reflects their importance to the young students' and our society's future. Second, we need to re-design the geo-education curriculum. Our system currently treats the subjects that contribute to geo-education as if they are unrelated. We believe that by joining forces around common goals, can create a strong enough sufficient resources for all of us.



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**Beyond stereotypes of Asian women in World Regional Geography: Revisiting Southeast Asia for feminist teaching and researches**

*Eje KIM (Republic of Korea)*

The cultural stereotypes of Asian women as being docile, passive, submissive, sexual and exotic objects are historically rooted in the Orientalism that arose out of Western colonization of Asian countries (Chan, 1988). Various stereotypes of Asian women persist within World Regional Geography textbooks, teaching materials and educational practices. More situated and spatialized approaches that are based on feminist visions can challenge negative stereotypes about Asian women and encourage and promote critical reflection on gender issues within World Regional Geography. Southeast Asia is a special region in terms of gender equity. In the 2013 Global Gender Gap Report published by the World Economic Forum, the best performer in the Asia-Pacific was the Philippines ranking 5th out of 136 while China at 69th and India at 101st lagged far behind. The status of women in many parts of Southeast Asia seems to have been historically higher than that in some western countries, as well as other Asian countries where strong patriarchal conditions still prevail. Japan loses four places to 105, mainly because of a decrease in the political power of women and South Korea positioned at 111, slips three places, largely on account of a decrease in labor force participation and perceived wage equality. The dynamics of gender equity can also be changed as a result of the development process. Post-war modernization, globalization and international economic development planning have often carried male bias, which has destabilized traditional wisdom and some of the existing patterns of gender equity. Jeffrey Hadler (2008) has paid a special attention to Minangkabau in West Sumatra, the most extensive existing matrilineal society in the world, regarding it as 'a hopeful exception'. Unlike the decayed matrilineal societies of Kerala and Sri Lanka in South Asia, the Minangkabau of Southeast Asia have survived against Dutch imperialism and intensive colonialism, the imposition of western systems and education, the pressures of modernity and globalization and even Muslim extremists. Surprisingly enough, Minangkabau women seem to have already achieved what western feminists want. They have built a women-centered world in their own egalitarian way by embracing new ideas of progress while retaining an essence of cultural traits and sustaining local lifestyles. Despite problematic condition for women in some parts of the region, including prostitution and marginal working conditions, Southeast Asian women have not been passive victims of the development process and globalization. Instead they have engaged actively in new chances and worked to resist conventional categorization and challenge problematic conditions brought with the western development program package. Women's everyday lives in Southeast Asia illustrate that they can be at the vanguard of ideologies that are universal in scope and global in ambition, while they can stay true to local custom and traditional culture. By revisiting Southeast Asia in World Regional Geography, new imaginations and fresh insights for feminist teaching and researches could be provided.



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IGU2015 – 3595

## Promoting Indigenous environmental knowledge in senior high school, a case study of Tayal, northern Taiwan

*Yu-lan NI, Da-wei KUAN, Su-Min SHEN (China)*

Geography education plays an important role in teaching learners to understand and to act sustainably in the world, which is in concert with environmental education. Abundant indigenous knowledge of sustainable uses of natural resources in various environments around the world has also long been recognized. In Taiwan, indigenous people's traditional territory of mountainous terrains coexists environmental knowledge of various indigenous tribes. Geography, as an individual and compulsory subject in senior high school level, however, seems hardly to refer to indigenous environmental knowledge, neither in the syllubus nor in the textbooks. Thus, this research intends to develop a course of environmental education with main theme of 'Tayal's environmental knowledge on river and fishing' for the senior high school students. The partner school is the Dasi Senior High School, which is located just downstream of the Tayal's traditional territory in northern Taiwan. Around 35 students have signed up the class, including students of Tayal, of other indigenous tribes and of Han Chinese. Volunteered indigenous students attended the extra training courses instructed by knowledgeable Tayal elders, and played the roles as teaching assistants at indoor classes and performing fishing skills at outdoor classes. Outcome evaluation shows that the understanding of the natural system and sustainable use of river of all students is improved. It also found that cultural identity of indigenous students increase significantly especially for those volunteered indigenous students who have grown up in the city.



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## A Seat at the Table: Using Deep Learning to Engage Students in Food Geography

*Karen S. BARTON (United States of America)*

University students often cite field experiences as some of their most important and memorable. Yet research shows that field experiences are on the decline in many colleges and universities; this shift also impacts geography courses that are traditionally field based. Often cited is the problem of instructor time, increased student enrollment and concerns over university liability. Yet field experiences give students unique opportunities to develop subject specific skills, enhance interpersonal relationships, and engage in "deep learning" and civic engagement. Thus this project employs pre and post survey data from a food geography course to better understand how combining direct and intensive field experiences with traditional classroom lectures and discussion shape geographic education.



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## Geographical education in a virtual globalization world of knowledge explosion

*Hein RAGHOEBAR (Suriname)*

This paper focus on the themes "Geographical Education in a Virtual Globalization World of Knowledge Explosion". The theme has inherent connection with the subject of the International Geographical Union Regional Conference in Moscow 2015", entitled "Geography, Culture and Society for Our Future Earth". Geography is a basic discipline at all levels of the education of the postmodern world. Students are by nature curious about space and places around them and try to associate the phenomena with the environment and the territory to declare at their level. The State of the geographical education, methods, curricula and teaching methods are national and international in discussion. As part of the globalizing world will geographical education as a result of knowledge explosion in line with universal standards towards a knowledge-based society in the future of the earth, reduce differences imbalance in geographical education and socio-economic differences between region's and cultures of the world. The principle of a knowledge-based society requires a new approach in learning, capacity building of teachers and application of large-scale new technological resources in the geographical education. This approach means, geographic learning and spatial thinking, exchanges and sharing knowledge and participate in international competent geographical network-relationships in the "Global Village. The transformation of the Earth in a "Global Village" requires the use of Information Communication Technologies (ICTs), the digital Geographic Information System (GIS) animated map with geographical information and transition of interdisciplinary research in science to transdisciplinary. On the other hand, teachers and students in the globalizing world faced with new attainment targets such as the disturbance relationship man, nature and the environment, global warming, climate change, globalization, economic recession, terrorism, trans-nationalization of the global society etc. Humanity is part of a huge, developed civilization in the universe. The Earth, "our habitat" is animated by a unique community of life. To be able to go, we need to recognize that we are a brilliant variety of human cultures and life forms one unit and one earth community with a common future . Culture has in the daily life of the man a consistent spatial layout of places at local, regional and global levels and trans nationalization of the global society. Companies and institutes are part of the human need in the production of goods and services adapted to the mosaic cultural values and norms. Culture mozaïc has an inherent connection with cultural diversity, multilingualilty, heritage, identity and multi ethnicity of the global population.



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## Modern geography: cognitive levels

*Vyacheslav SUKHORUKOV, V.P. SOLOMIN (Russian Federation)* The strength of geography now goes to the semantic area that is proportional to the experiences and feelings of life. This focus comprehension of space clearly distinguishes modern geography, among other disciplines. Structure of modern geographical science should be seen in the new contour lines and research opportunities. Are the following research levels: geographical factology, geographic conceptology, geographic praxeology. Geographical factology - an area of scientific knowledge about how to describe and analyze geographic objects, phenomena and processes in order to systematize them. Geographical conceptology - a system of views and opinions that reflect the scientific point of view, in the form of plans, ideas and constructive principles in explaining and transformation of research subject. Geographical praxeology identifies a number of specific structural disciplines implementing effective substantive reflection of the achieved level of knowledge. These lines of geographical thought should be reflected also in the training of geography.



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## Conception and Development of an Online Database for Outdoor Education

*Anne-Kathrin LINDAU, Kathrin JÄGER, Christian DETTE, Detlef THÜRKOW (Germany)*

Outdoor education is important in geographical education in school (German Geographical Society 2014) and higher education. Traditionally it has always been important for other natural scientific subjects. There is now a huge supply of outdoor education concepts and ideas which are documented and published in many journals. But the difficulty is to overview these diverse offers and to find and use them for field trips easily. At the moment a complex online data base for ideas and methods for outdoor education are missing. This is the reason for the conception and development of an online database for outdoor education which integrates field methods, outdoor learning environments, and field trips. The main purpose of the project is to provide access for teachers and students to field methods and field trip ideas to foster outdoor education learning. Subject / Problem: There are lots of descriptions and documentations of field trips, concepts and research about outdoor education in journals. Nonetheless it is difficult to find quick and purposefully an idea for field trips which need to be organized. This is the reason to establish an online database for outdoor education. The aim is to offer a lot of materials for outdoor education learning settings and environments. In general it is important to get a basis for system oriented projection to allow a classification of the parts of the education opportunities. A fundamental aspect of the project is to integrate the participants in using and arranging the database. The planned online database consists of the following sub-objectives: 1. To collect and document field methods at a pre-university level and locations of outdoor learning environments with the possibility of combining them to field trips. 2. To offer the opportunity to integrate field methods, locations and field trips in the data base. Study Design: Geography sees the earth as a human-environment or human-earth system from a spatial perspective. The analysis on site and the gathering information with field methods are important aspects of geographical education. Therefore the planned online data base is grounded on the idea that the earth is a system which is separated in two parts, the general geography and regions. The aim is on the one side to present general and transferable offers of outdoor education which are modified for different locations. On the other side it will offer different locations which are identified by their individual characteristics. These location points can be used to create field trips in different possible combinations. Some completed field trips will be offered as well. The users can also arrange the proposed location points of individual field trips by drag and drop. The landscape factors of the earth system can be analysed at subordinate levels with concrete



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education offers like field methods in different types of media. Therefore the field methods are classified with the earth factors e.g. the physical sphere (climate, soil, water, geomorphology, vegetation, geology) and the human sphere (population, settlement, transport, economics). The field methods are available in the form of papers with steps for method training for students, description for teachers as pdfs, videos and foto documentations. In addition to providing education offers in the methodic and local domain is another important aim: the activity of the database user. The planned participant approach consists of the design and supplement of new field methods and field trips trough the user. For this purpose it is an ability to upload new local information and field methods to the online database. An authorised person is responsible for the quality of the education offers. Additionally it is possible to integrate new locations and field trip routes combined with content information in the online database. Findings / Discussion: Up to this point a conception oft he online database has been developed for outdoor education, in which the system thinking is dominant. In the practical part some pre-service teachers developed many field methods, which were filmed. 30 pre-service teachers wrote papers about field methods for students in school. Guidelines for teachers complete the field method collection in the natur science area. Methods for analysis of soil, water and weather as well as plant identification. Additional methods of spatial orientation are important. The pre-service teachers presented their field methods in the field and were filmed. Brief Conclusion: The additional benefit of the online database of outdoor education is the systemic access and the multiperspective approach to locations and field methods. Another advantage is the possibility of teachers, pre-service teachers and students in school to integrate their own offers to the online database. By providing field trips and field methods the repertoire of database will be continually expanded. For the future it is planned to evaluate the database and to measure the contribution to competence development in teacher education in the field of outdoor education. References German Geographical Society (2014): Educational Standards in Geography for the Intermediate School Certificate, Bonn. Gilbertson, K., Bated, T., McLaughlin, T., Ewert, A. (2006): Outdoor Education. Methods and Strategies, Human Kenetics (USA). Kolb, D., Boyatzis, R., Mainemelis, Ch. (2000): Experiential Learning Theory: Previous Research and New Directions, In: Sternberg, R. J., Zhang, L. F. (Eds.): Perspectives on cognitive, learning and thinking, NJ: Lawrence Erlbaum. Kyvik, S., Lepori, B. (Eds.) (2011): The Research Mission of Higher Education Institutions outside the University Sector - Striving for Differentiation. Dordrecht, Heidelberg, London, New York.



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## Primary Geography Education: curricula and methods of teaching

*Marina SMIRNOVA (Russian Federation)*

Standart and Programmes. Variety of programmes reflects the positive changes at primary education. "The would around us" : the structure and goals. Geography as a part of the course "The would around us". Methods of teaching: problem solving, games, projets.



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## School Based Geography Assessment In A Context Of A New Educational Standard In Russia

*Olga KHLEBOSOLOVA, Laura TSAREVA (Russian Federation)*

Geography teachers start to teach fifth-graders with using of a new standard and the new textbooks this year. This document contains requirements to results of training and ways of their assessment [1]. A geography teacher has to form and estimate different results of training: knowledge of geography and its methods of research (subject results), ways of educational activity (met subject results) and socialization in training and learning (personal results). The purpose of our research was to analyze the teachers' difficulties in assessment of geography education results in a context of the new standard requirements. 45 teachers of Moscow and the Moscow region took part in the research. They answered oral and written questions of the questionnaire. Studying of teachers' opinions shows that preparation of materials for summative assessment is especially difficult. The main reasons are the following: (1) the standard provides writing of the School educational program with the part for School based geography assessment; (2) the teacher has to make standardized tests and other tasks (essays, educational and scientific researches, imitating games) for pupils of 5 - 9 classes; (3) pupils' answers have to show their annual geography achievements and other results and their five-year trends. Teachers need special courses, seminars and master classes for preparation of standardized tests, creative tasks for individual and collective work, tasks for "learning through research" program. Sources: [1] Federal state educational standard of the main general education (The order of Education and Science Ministry of the Russian Federation, No. 1897, 17.12.2010). – 50 p.



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## Combing of field practice and lectures for ecology students study

*Alexandra GORETSKAYA, A.V. EVSEEV (Russian Federation)*

Preparing students for specialization "ecologist" at the department of environmental management, faculty of geography, Moscow State University different lecture course are taught. For example "Geo-environmental monitoring", "Methods of laboratory and field studies", "Fundamentals of bioindication and biomonitoring", are among most important in the preparation of specialists in environmental management. Most of the time is devoted to lecture courses. Discipline needs to be based on independent work of students in the upcoming academic and industrial practices, and further in their professional activities. Knowledge gained by the course are the base to development by courses as "Development and transformation of the geographical environment", "Environment and Human Health", "The doctrine of the biosphere" and are necessary for training bachelors in "Ecology and Environmental Sciences". Students consolidate knowledge from lectures during the field practice, which has three parts: in Moscow, the Crimea and on the Kola Peninsula. The main purpose of the practice is to find out information about geo-ecological situation in the region. The department has developed a new approach to training, to combine theoretical, laboratory and field part of the educational process. Thus, we achieve a continuous cycle of learning students: theoretical knowledge of environmental monitoring - field observations and sampling in the areas of human impact, collecting field data and interpretation in laboratory. A combination of lecture course, the field of educational practice and laboratory processing of materials allows students specializing in ecology and nature to learn better the basics of environmental monitoring and gain practical skills in analysis.



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## Geoportal in geographical education: advancement of cartographic collections

*Marina GOLYASHEVA (Russian Federation)*

Throughout its history, mankind has accumulated a huge amount of cartographic materials, continuing to create them daily. Maps and atlases provide basic information for different geographical, geological, historical researches and many others. Now maps published in traditional paper form are actively converted into digital form by scanning. They should act as spatial data along with vector GIS data and satellite images and should be involved in SDI - Spatial Data Infrastructure. Currently, Russian State Library (holder of the largest Russian collection of maps and atlases) and Moscow State University of Geodesy and Cartography (MIIGAiK) are working together to establish a specialized geoportal which will represent cartographic materials from the library and the university. The geoportal database includes digital copies of cartographic materials (scanned with high resolution and georeferenced), as well as their detailed structured descriptions. The developed search method allows geoportal users to search for maps by the territorial scope, scale, authors, keywords, and other parameters. One of the important goals of the geoportal is its use for educational purposes. The service can be useful for school teachers and students in secondary school, especially for facultative studies. It can be widely used in universities providing geographical education, specialized cartographic institutes and colleges, different scientific organizations - for professors, students, postgraduates, etc. For example, the geoportal user would be able to overlay old maps, modern satellite images and vector data with the purpose of studying dynamics or revealing geographical regularities. In the nearest future the RSL and MIIGAiK geoportal will be ready for research and educational work.



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**Importance in the secondary education institutions of the European Union Comenius Projects: Kadikoy-Intaş High School Comenius Projects Examples**

*Gulcin ERTEK, Ahmet ERTEK (Turkey)*

The European Union (EU) was established on 25 March 1957 in Rome including the member states of Italy, Belgium, Germany, France, the Netherlands, Luxembourg and Italy for the membership of the European Economic Community. Turkey were admitted to full membership in the EU on 1 April 2004 for the membership state. European Union Education and Youth Programs has entered into a new period on 1 January 2007. Turkey were enrolled as a "full member" since 1 April 2004, which lasted until the end of 2013, covering a period of seven years to the Education and Culture Lifelong Learning Programme of EU Comenius Projects. Three different Comenius Project were studied with various EU countries under my coordination in our high school between 2005 and 2013. These Comenius Projects common language is English and each country participated in teams of students and teachers these exchange projects. Our Comenius project's names are: (1) Society Growing Old? (2) Fun Fun Future-Let's Love Learning (3) The European Cultural Word in Children's Folk and Fairy Tales. The aim of the EU-Comenius project, "School Education" in cooperation with other European countries and to improve the quality of education by providing cultural dialogue is to promote language learning. In addition to this, in particular, in different cultures living, education, arts, sports and language diversity in unity by revealing a common European idea was to demonstrate. Project of the common objective foremost, the mutually students and teachers in their own country guest in their home to accept and during the day in schools public education all together as a team, will continue these differences reveal the most important association that creates. One or two-year period and the last repetition in other countries of this project in the host country of the project is to create a final report. In this way, different countries and cultures that students and then primarily due to an increase in teachers' quality of life in advanced life is that a large contribution. Key words: Education in the European Union, The European Union Education and Youth Programmes, The EU-Comenius Projects, Kadiköy-High School Istanbul-Turkey.



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## Training manual "Ecology and balanced nature management" for secondary schools

*Ludmila BAGROVA, V.A. BOKOV, L.M. SOTSKOVA, L.Y. GARKUSHA (Russian Federation)*

The program of the geographical-based course "Ecology and balanced nature management" and content of the related training manual for secondary schools are developed and approved. The course is aimed on: - the formation of an environmental worldview aimed at the rejection of consumer values and society orientation on a co-creation with nature; - the acquiring knowledge considering the biosphere as a global natural unity, landscape systems as the natural basis of the human existence and the biodiversity as a valuable resource reflecting a multimillion evolution of the Earth; - the forming of specific knowledge about environmental ethics and greening of life activities. The training manual consists of two parts. The first part provides the reader with the description of the object of ecological study. In the framework of the training manual: environmental management is analyzed, the history of development of science and nature use management is described, the global and regional environmental problems are considered. Moreover, the ways of restructuring the energy basis of humanity in the frame development of solar energy are characterized. The environmental problems associated with urbanization, agricultural activities, transport, industrial and household waste are analyzed. A significant part of the content is devoted to the issues of preservation of human health. The methods of environmental research to establish norms of impact on the environment are discussed. In conclusion the issues of sustainable environmental development of the countries and regions are considered. The second part is dedicated to the problems of ecology and environmental management at the regional and local level. A special attention is given to the Crimean region which is described as a miniature version of the Russian plain landscapes. It is characterized by a great landscape and biological diversity, different types of environmental management systems and Historic-Cultural Monuments. In this regard the region is convenient as a platform for research and educational field studies. The instructional methods required for teaching this training manual and the exercises for classroom and independent work are developed. A significant part of the practical work is carried out in conditions of natural, urban and agricultural landscapes. All themes are presented in multimedia form and posted on the Internet. The program and the contents of the manual have been reported and discussed at advance training courses for teachers.



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**Russian-Korean students and teachers exchange program as part of geographical education**

*Arkady SARAVAISKY (Russian Federation); SONG Sun Hee, YOON Young Ki (Republic of Korea)*

The program is implemented since 2011 in frame of Memorandum of Understanding between School #34 and Ulsan Foreign Language High School and can be considered as an important part of geographical education. Principal goals of the program are: stimulate studying of Korean and Russian geography, history, economy and social life, develop international communication skills, support dissemination of Korean and Russian languages, maintain relations between two countries. Principal methods are: exchange of information, joint classroom and extracurricular activities, speaking Russian and Korean, study of physical and social geography, national culture and traditions of Russia and Korea, constant practical experience, involving students of all ages (incl. primary school). Principal measures are: annual students and teachers exchange, classes on geography of Korea and Russia, quizzes (e.g. "What we know about Korea", "What we know about Moscow"), classes on Korean and Russian languages, master-classes on traditional clothes, crafts, games and cuisine, excursions, workshops and conferences, issuing of media materials (photo exhibitions, newspapers, video etc.). Principal results of the program in 2011-2015 are: growth of students' and teachers' mutual interest in discovering Korea and Russia, in continuing education in Korean and Russian universities, dissemination of information about Korea and Russia and useful experience in educational, cultural, economic and social fields, development of skills and abilities in students (creative skills, industry, discipline, perseverance, diligence etc.), creation of "kids – adult" international school community, dissemination of volunteer practice. The program will be continued in 2016 - 2017 and new results of further steps are expected.



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## The "Lomonosov" Geography Olympiad for schoolchildren as an innovative way of identifying and selecting talented young people

*Lidia ISACHENKOVA, Yulia FUZEINA, Mikhail KAZMIN (Russian Federation)*

Talented youth is a national heritage of Russia. A strategic objective of the Faculty of Geography of Lomonosov Moscow State University is the identification and selection of talented young people who in the future can be engaged in fundamental research in the field of geography. The "Lomonosov" Geography Olympiad has been held since 2005. The major objectives of the Olympiad are to identify and to develop high school students' creative abilities, to increase their interest in geographical research activities, to promote scientific knowledge among young people. Every year more than two thousand people from almost all the subjects of the Russian Federation take part in the competition. The Olympiad is held for the young people of different age groups (students of the 5 th -9th years and the 10 th -11 th years) and consists of two stages, represented by the qualifying round and the final. During the qualifying round, the participants have to complete a test as part of the competition and to answer original questions, requiring additional study of textbooks' materials, atlases and special literature. The final stage of the "Lomonosov" Geography Olympiad is held in Moscow at the Faculty of Geography, Moscow State University, as well as at the regional sites in different cities of Russia. The tasks offered during the final stage of the Olympiad cover the main areas of physical and economic geography of Russia and of the world. The most challenging tasks are represented by integrated questions, incorporating the elements from various fields of geography. Each year, the winners of the "Lomonosov" Geography Olympiad enter the Faculty of Geography of Moscow State University, and later demonstrate high achievement both in the academic studies and in the scientific research.



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# C12.12 Geographical Information Science

## GIS or Information Systems: the boundary between basic and applied research 1

**Chairperson(s):** *Francis HARVEY, Andrey MEDVEDEV*

- Employment of Location-Based Service Technology to Establish An Air Pollution Alert System in Taipei City

  *Bor-Wen TSAI, Yu-Feng CHIEN (China)*

- Generation and Accuracy Assessment of Digital Elevation Model Using Digital Photogrammetry and Differential Global Positioning System Techniques

  *Sachin Shantaram PANHALKAR, Amol P. JARAG (India)*

- New technologies of creation and use of geoinformation resources in the Earth science

  *Irina LURIE (Russian Federation)*

- Spatial database for ecological and geographical mapping of the North Caspian

  *Alexander KORSHENKO, Ali ALYAUTDINOV, Vadim ALYAUTDINOV, Ludmila USHAKOVA (Russian Federation)*

- From "Digital Earth" to Academic SDI: methods and ways of data integration

  *Andrey MEDVEDEV (Russian Federation)*

## GIS or Information Systems: the boundary between basic and applied research 2

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- Visualizing Brazilian Economic And Social Spatial Differences Using Gis And Multivariate Statistics

  *Joao Francisco de ABREU, Marcos KUTOVA, Jose PAIVA (Brazil)*

- Application of Geographic Information System To Identify Vulnerability Level of Fire Settlements in Yogyakarta City

  *Gerry UTAMA, Bernadetta FEBRIANNANINGSIH, Ratri NISAA, Muhammad WAFIQ (Indonesia)*

- Remote sensing Earth sciences focused on regional physical-geographic studies

  *Vladimir KOZODEROV, N.G. KOMAROVA, T.Yu. LIVEROVSKAYA, O.V. LYUBCHENKO, L.V. ROMINA (Russian Federation)*

- Surveying Participatory GIS and the potential to expand geographic education

  *Roman ROSIBEL (United States of America)*



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**GIS or Information Systems: the boundary between basic and applied research 3**

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- Defining boundaries of coastal features using GIS

  *Hyo-Hyun SUNG (Republic of Korea), Hyowon BAN (United States of America)*

- Ideal Models of Reality and Geography

  *Anatoly KOSIKOV (Russian Federation)*

- Using GIS technologies for assessment of recreational lands and resources on the example of Lori marz, Armenia.

  *Shushanik ASMARYAN, Azatuhi HOVSEPYAN (Armenia)*

**GIScience and geography education: From learning and discovery to science**

**Chairperson(s):** *Francis HARVEY, Andrey MEDVEDEV*

- Geovisualization in Multiscale Environments: Mapping Hierarchies By Different Representation Techniques

  *Timofey SAMSONOV (Russian Federation)*

- Geoportal for large-scale archival maps of the provinces and territories of Russia in XIX century

  *Vladimir SHEKOTILOV, Oleg LAZAREV, Oksana LAZAREVA, Maria SHALAEVA , Andrey SHEKOTILOV, Svetlana SHEKOTILOVA, Irina SUROVCEVA (Russian Federation)*

- Reconsidering accuracy in an era of ubiquitous cartography

  *Francis HARVEY (Germany)*

**POSTER EXEBITION**

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- Renewable energy sources as an object of GIS mapping

  *Yu. RAFIKOVA, B.A. NOVAKOVSKIY, S.V. KISELEVA, A.I. PRASOLOVA (Russian Federation)*



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- Atlas mapping as a tool for conservation of unique internationally significant ecosystems (on example of the Valley of the Geysers in Kronotsky Reserve)

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  *Alexander TITOV, Evgeny GORDOV (Russian Federation)*

- "Concept and program of the Atlas "Great Altai: the Nature, History, Culture" on the basis of means of GIS

  *I. ROTANOVA, V.S. TIKUNOV (Russian Federation)*

- Creation of information mapping retrieval system of the dating determinations for alluvial deposits of Russian Federation.

  *Andrey PANIN, Ali ALYAUTDINOV, Nikolay SEMI, Ekaterina MATLAKHOVA (Russian Federation)*

- World Ocean floor geomorphology in the general geomorphological map of the World

  *V.I. MYSLIVETS, S.A. LUKYANOVA, G.D. SOLOVIEVA (Russian Federation)*

- Design of multidimensional geographical models

  *Ludmila USHAKOVA, A.G. KOSIKOV (Russian Federation)*

- Development of the Internet GIS System of Long-term Small Area Population Projection for Japan

  *Takashi INOUE (Japan)*

- Modeling technique of relief morphometric parameters in the ecology-geographical studying of catchment basins

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- Russian science and educational geoportals: an overview

  *Alexander KOSHKARE, Irina ROTANOVA (Russian Federation)*

- Geoinformational modeling of the current state of vegetation cover of a region

  I.N. VLADIMIROV, A.P. SOFRONOV, A.A. SOROKOVOY, D.V. KOBYLKIN, A.A. FROLOV (Russian Federation)



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## Employment of Location-Based Service Technology to Establish An Air Pollution Alert System in Taipei City

*Bor-Wen TSAI, Yu-Feng CHIEN (China)*

Air pollution is a crucial issue for residents' health in urban areas. Many sources may cause air pollution such as sandstorm , industrial emission, or motor vehicles. Taipei city is the capital of Taiwan with more than 2.5 million population. The main source of air pollution comes from 1.8 million registered motor vehicles and additional vehicles from nearby townships. The monitoring and warming system becomes the most urgent service by the city government. The Taiwan Environmental Protection Agency (EPA) has implemented 60 air quality monitoring stations in the whole island. However, there are only 6 stations locate in Taipei city. In consequence, residents in Taipei do not have sufficient information to escape from air pollution in commuting. An alternative monitoring system was developed in this study. This study employs the emerging GIS (geographic information system) LBS (location-based service) technology to incorporate real-time traffic data provided by the Department of Transportation, Taipei City Government. The carbon monoxide emission for each street segment is calculated from the data. Then, the emission is translated to pollution concentration based on the concept of street canyon. The spatial estimation of the pollution concentration from motor vehicle is verified by comparing with the 6 EPA monitoring stations. Finally, an Android-based mobile application (APP) is developed to provide real-time alert when walking or driving in an air-polluted area.



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# Generation and Accuracy Assessment of Digital Elevation Model Using Digital Photogrammetry and Differential Global Positioning System Techniques

*Sachin PANHALKAR, Amol P. JARAG (India)*

Digital elevation model is the finest tool for visual and mathematical analysis of topography, landscapes and land forms, as well as modeling of surface processes. Indian Cartosat-1- satellite data was designed mainly for the purpose of cartographic applications & for terrain modeling. The global availability of Cartosat-1 satellite data provides baseline information for many types of worldwide research. However, the overall generation of the DEM of this product requires additional regional as well as global studies involving ground truth control and accuracy verification methods with a higher level of precision. For the present study, Panchganga basin of Kolhapur district, Maharashtra has been selected. The main objective of the present study is to generate and assess the accuracy of Cartosat-1 DEM using digital Photogrammetry and DGPS techniques. Initially, block triangulation has been generated with point positioning accuracy and it is being achieved with the Rational Polynomial Coefficients (RPCs) sensor model. Thirteen GCPs were collected by using advance DGPS techniques. Interior & exterior orientations have been performed through sensor model and GCPs. Finally, DEM has been generated using LPS environment. RMSE & Standardized RMS statistical techniques have been applied to assess the accuracy of Cartosat-1data. Accuracy assessment reveals that Cartosat -1 satellite data is having 6.13 m and 6.23 m RMS & Standardized RMS for generated DEM.



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**New technologies of creation and use of geoinformation resources in the Earth science**

*Irina LURIE (Russian Federation)*

The scientific and applied problems of integration GIS-resources and an easy access to them by creation of specialized infrastructures of spatial data, geoportals, databases of collective use and web-GIS - are actual and far from the decision, especially in the field of thematic researches. As the theoretical basis of methodology of creation of information resources can serve the scientific concept of integration of methods and technologies of cartography, geoinformatics and remote sensing. This concept is formulated and practically developed in works of department cartography and geoinformatics of geographical faculty of the Moscow State University. Now integration of such methods and resources forms the basis of technologies of researches in the Earth sciences. According to this concept for service of researches of changes of an environment and a society it is necessary: – Creation of structured sets of basic spatial objects, and also object-oriented thematic geodatabases, their contents is connected first of all with purpose of the study, instead of with scale of representation; – It is necessary to develop methods for creating cartographic databases for multiscale mapping based on the generalization of object database that will ensure the creation of reliable cartographic models of reality and the development of electronic thematic mapping; – Creating thematic geoportals as location sources of geodata, storage, and presentation of the results of the analysis, including in the cartographical form. Formation of maps and geodata services, field data and remote sensing means geoportal, as well as the development of geoinformation and analytical support to work with the spatially-certain data from different sources across the geoportals and Web-mapping application will significantly increase the efficiency and fundamental and applied research.



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## Spatial database for ecological and geographical mapping of the North Caspian

*Alexander KORSHENKO, Ali ALYAUTDINOV, Vadim ALYAUTDINOV, Ludmila USHAKOVA (Russian Federation)*

Currently it is necessary to form complex scientific approaches to the assessment of the dynamics of quantitative and qualitative indicators hydro, chemical and biological state of the Caspian Sea ecosystem. Assessment of the sea state is based on the target field and experimental studies of research institutes, as well as data obtained from State Observation Network (SON) as a part of monitoring system of the marine environment and results based on the monitoring of large offshore oil and gas projects. The main goal of research is ecological and geographical mapping of the Northern Caspian. The results will help to establish general patterns of long-term spatial and temporal distribution of indicators of hydro chemical and biological parameters, as well as the level of pollution of the marine environment. Determination of sustainable properties of the waters can be used in the economic and environmental activities on the northern shelf of the Caspian Sea and to create an optimized environmental monitoring system. Also, it is neccessary to use ecological and geographical approach, which determines the territory of the North Caspian Sea as a specific uniform hydrodynamic system, strongly linked with surrounding land, their hydro climatic, ecological and economic characteristics. Ecological and geographical mapping of the Northern Caspian Sea was based on aggregate analysis of the physical and chemical properties of the water masses and major pollutant indicators using geo-information technologies. As a result of research spatial database of different properties of water of North Caspian Sea was created. Database allows querying over a large number of environmental parameters, building their statistical and graphical evaluation on the basis of long-term data set (1978-2014). Results of database analysis can be visualized in ArcGIS software.



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## From "Digital Earth" to Academic SDI: methods and ways of data integration

*Andrey MEDVEDEV (Russian Federation)*

The stages of geoinformatics development in the academic society in Russia may be illustrated by the studies carried out at the Institute of Geography RAS (IG RAS) in the 2000-2014. The migration of GIS desktop environment into a network environment on the basis of an academic SDI. Its creation will help solve the problems of integration of big, heterogeneous, poorly structured, multi-temporal and geographically disparate informational resources above all, spatial data of various institutions, centers and branches of the RAS. In addition to the 20 institutions of RAS that specialize in geography and environmental science and posses significant resources of spatial data (in forms of digital and electronic maps, electronic atlases, GIS) geographical research is also conducted in 110 faculties of Russian universities. The academic SDI in the future could bring together not only academic but also civil interests. Principles and approaches to the academic SDI creation were inherited from the "Strategy of SDI creation", developed in the course of joint research by IG RAS and RAS Computing center (CC RAS) with the use of geoportal "GeoMeta" software functionality as a central hub for the future academic network ("GeoMeta-CCRAS"). The geoportal is a as part of the information-analytical system is based on the platform of Unified Scientific Information Space (USIS) RAS. The structure provides the registration of spatial data on the geoportal as metadata, the search for new data from various sources and its collection in the form of metadata, data visualization, analytical queries to the database.



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## Visualizing Brazilian Economic And Social Spatial Differences Using Gis And Multivariate Statistics

*Joao Francisco de ABREU, Marcos KUTOVA, Jose PAIVA (Brazil)*

This paper aims at mapping the economic and social scenario in Brazil in the perspective of sustainable human development in 2000 and 2010. It starts with a conceptual framework, providing the characteristics of the concept of life quality, with emphasis on features related to the adopted perspective working as guidelines for the choice of variables that compose the database used in the paper. For the characterization of life quality in Brazil, classifications were carried out through the PCA/Principal Components Analysis , which allowed extracting information that explains the situation in that period, based on which the cartographic generation, characterizations and analyses were made. Thus, the aspects of infrastructure and human capabilities were identified, and studied with basis on cartograms that help understanding and analyzing the national framework through the comparison of the obtained results with the HDMI – Human Development Municipal Index, a high correlation between them being detected. The analyses highlight the heterogeneity of the various situations, in a country geographically divided into distinct realities. A 'life quality topography' using pycnophylatic reallocation was generated, showing poverty centers and realities similar to those in more developed countries. In this set of features, the big cities show the strongest contrasts, in an intra-urban context where the periphery is in the centre. KEY WORDS: Spatial Analysis; Life Quality; Principal Components; Sustainable Human Development; Classification; Geographical Information Systems; Digital Cartography; Brazil.



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## Application of Geographic Information System To Identify Vulnerability Level of Fire Settlements in Yogyakarta City

*Gerry UTAMA, Bernadetta FEBRIANNANINGSIH, Ratri NISAA, Muhammad WAFIQ (Indonesia)*

Fire phenomenon that occurs in settlements in urban areas is one of the disaster-prone to occur in the region. This study aimed to perform zoning on the level of vulnerability to catastrophic fires in urban areas in the city of Yogyakarta. The research method is to determine the parameters that influence include the density of buildings, residential location, building dimensions, the width of the road, the condition of the electrical network. Of parameters are then weighted by using GIS to perform analysis, spatial data manipulation, processing, and presentation of the results of the analysis of spatially fire vulnerability levels in urban areas. The results of the study showed that the level of vulnerability to fires in urban areas indicates that the level of vulnerability to fire grouped into five classes. The highest level of residential fires are in the area of high density housing with a narrow road conditions and the existence of minimum facilities while the low level of vulnerability to fire located in the residential area of low density and width dimensions of the great and good electrical network facilities. The study shows in part on the city of Yogyakarta have vulnerabilities distribution fire spread unevenly.



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## Remote sensing Earth sciences focused on regional physical-geographic studies

*Vladimir KOZODEROV, N.G. KOMAROVA, T.Yu. LIVEROVSKAYA, O.V. LYUBCHENKO, L.V. ROMINA (Russian Federation)*

Starting from the first precision satellite systems in the 1970s-1980s, remote sensing Earth sciences have passed through a wide range of regional studies from visual decoding images from photo and scanning instruments to updated automation techniques of multi-spectral (6-7 spectral bands of visible and near infrared wavelengths) and hyper-spectral (hundreds of spectral bands) imagery processing. Pattern recognition of regional objects in a particular subject area is a major discipline that encompasses algorithmic and programmatic tools of the relevant remote sensing data processing. A specialized sector of remote sensing Earth sciences research was created in Museum of Earth Sciences late in the 1980-s on the basis of physical-geographic regions and natural zoning and soil formation departments. Imaging spectroscopy with hundreds of spectral channels as a part of remote sensing Earth sciences has evolved later towards wider understanding the information content of the air-borne and space-borne images of high spatial resolution. Being oriented on the science and technology disciplines of data processing, the related techniques are based on the available chronicles of nature, particular protected regions, forest inventory, forest typology, geo-botanical and other ground-based observations. Validation of the remote sensing information products of data processing is an important part of the techniques elaborated. Some results of the air-borne campaigns with a domestic imaging spectrometer and ground-based campaign on a test forested area are presented using the listed categories of observations. These results published in high rating foreign journals deal with retrieval of forest stand attributes using hyper-spectral air-borne remote sensing data of forest recognition for different species and ages on the test area.



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IGU2015 – 2070

## Surveying Participatory GIS and the potential to expand geographic education

*Roman ROSIBEL (United States of America)*

Critical geographers have explored the potential of geographic information systems (GIS) to provide communities with a means of gaining representation, recognition, and participation in the decision-making processes that affect their lives and environments. Although the use of GIS to respond and deal with a variety of social and environmental issues has been critiqued for technocratic approaches that alienate local knowledges, there has been a growth in the application of GIS towards directly engaging communities by providing opportunities for individuals who are not necessarily formally trained in research to participate in the research process. This has expanded into an entire new sub-field within geography – participatory GIS (PGIS) – heralding the potential to better enable communities to identify and communicate local concerns. In addition, the practices and material availability of tools that enable PGIS open up a range of opportunities to expand geographic education and hands-on learning. This paper will survey a range of cases in which PGIS has played important roles in communities' efforts to address social and environmental problems as well as served to provide educational, hands-on experiences in GIS. Finally, the paper will propose new potential paths in PGIS and the production and representation of local knowledge.



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## Defining boundaries of coastal features using GIS

*Hyo-Hyun SUNG (Republic of Korea), Hyowon BAN (United States of America)*

There have been many works that represented boundaries of coastal features on maps, however many of them suggested different boundaries for the same feature. For instance, boundaries of a particular bay or a port vary among some existing literature. Due to the subjectivity, it is problematic for stakeholders to use such uncertain boundaries of costal features for decision making about coastal areas. Therefore, it is necessary to develop a new approach to define the boundaries of coastal features based on multiple disciplines including Geographic Information Science (GIScience), oceanography, and other social sciences. In this research we review existing definitions and boundaries of coastal features in terms of better management of costal feature names and develop some guidelines for the standardization of coastal feature names of South Korea using GIScience. As a demonstration for the guidelines, we suggest example boundaries of some selected costal features in South Korea by developing a database that includes both spatial and oceanographic data. To deal with the uncertainty of the boundaries of costal features due to the multiple definitions, we use fuzzy-set approach to represent the boundaries as fuzzy objects rather than crisp line objects in maps. Results from this research provide the example guidelines for the standardization and visualization of the boundaries of coastal features.



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## Ideal Models of Reality and Geography

*Anatoly KOSIKOV (Russian Federation)*

The evolution of computing facilities in the storage volume and speed of information processing prepares opportunities for the development of detailed space-time models based on doxel representation, reflecting the processes and phenomena of nature with the fullness and accuracy in the real, accelerated and decelerated, forward and reverse time stream for the environment. The emergence of models, which should be the digital mirrors of reality, is the task of the upcoming future, the solution of which will provide a qualitative leap both in the applied exploration and the fundamental research of the nature. The purpose of the investigation is to develop the concept of the establishment and functioning of digital space-time models, where the model is considered as a continuous, deployed in the future, self-adjusting computational process, providing more and more accurate and authentic reflection of the growing number of the matter properties at more and more increasing spatial and temporal resolution and extent. The study discusses the principles of construction and operation of the doxel space-time models, the criteria they must meet, justifies a wide range of requirements, illustrates the relationship of their elementary cells with databases, describes the model development in expanding space-time coverage, increasing accuracy, completeness and reliability, relates to the use in geographical research. The image examples of the Earth experimental doxel models created by the original software on the base of proposed principles are listed. The study substantiates the idea of the ideal doxel type digital model as the most perfect form of the reality reflection, which itself will be an inexhaustible object of geographical research of the future.



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# Using GIS technologies for assessment of recreational lands and resources on the example of Lori marz, Armenia.

*Shushanik ASMARYAN, Azatuhi HOVSEPYAN (Armenia)*

Recreational activities of peoples are one of most essential socio-economic factors and have a strong resource-oriented character. As a land user such activities are behind agriculture and forestry only. Hence, a proper arrangement of recreational activities can help manage both ecological and socio-economic issues such as employment development of service economies and so forth. The area of the Republic of Armenia enjoys diverse natural and climatic conditions which create prerequisites for development of recreational industry in some regions. From this viewpoint one should emphasize Armenia's Marz (province) of Lori notable for its natural, geographical and cultural and historical assets and potential. To evaluate recreational potential of Lori Marz and isolate best effective kinds of recreational activities • the recreational potential evaluation criteria and indicators have been developed and adapted to Lori Marz area, • the methods of GIS applicability to conditions of a health resort and recreational region have been specified, • Geodatabases have been complied and series of thematic maps produced which reflect different indices of recreational potential of Lori marz area A proper arrangement and harmonious development of recreational economy in Lori Marz can help manage a scope of socio-economic problems and namely organization of summer vacations and recovery of Armenia's population, large-scale investments and as a consequence development of recreational economy as most profitable branch of Lori Marz economy, partially managing thus a problem of employment opportunities for local people.



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## Geovisualization in Multiscale Environments: Mapping Hierarchies By Different Representation Techniques

Timofey SAMSONOV (Russian Federation)

Multiscale mapping is a hot topic in modern cartographic community, and is widely applied in geographic research. It helps us to understand the structural patterns of geographical phenomena that appear in different scales of observations. Sometimes these patterns are established by human, and may have strictly defined borders, such as hierarchy of administrative units. Most of the natural phenomena do not have such well-defined partonomy and can be decomposed into structural levels using spatial statistics and generalization techniques. Our observational research summarizes modern achievements in development of specialized visualization techniques and supporting data analytics for multiscale mapping. We show that appropriate selection of graphical variables, such as color and size of symbols and areas, is essential for understanding the differences between value distributions and spatial distributions in different scales. Changes appearing across scales can be closely related to modifiable unit problem in case of administrative units, and should be reflected in visual representations. We introduce a set of rules for thematic and general mapping that allow for consistent changes of symbology in map zooming process. One of the novelties of our study is establishment of the close relationship between visualization technique and underlying generalization operations that support not only the geometric representation of the phenomena itself, but gives the base geometric information for symbol placement and related properties. The study is illustrated by various examples from general, hypsometric, hydrometeorological and socio-economical mapping.



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**Geoportal for large-scale archival maps of the provinces and territories of Russia in XIX century**

Vladimir SHEKOTILOV, Oleg LAZAREV, Oksana LAZAREVA, Maria SHALAEVA , Andrey SHEKOTILOV, Svetlana SHEKOTILOVA, Irina SUROVCEVA (Russian Federation)

The richness of informational data of archival maps explains their high demand. Using the Internet allows to implement functional access to them without visiting the place of storage in-person. Due to a number of reasons portals of libraries and archives usually represent maps by scanned sheets. A significant percentage of users actively use geoportals with modern maps and satellite images. The most informative are the topographic and military topographic maps of the nineteenth century. The experience of creation of data resources on the maps of neighboring provinces allowed the authors to go on to creating the resource blocks of maps, one of which is the maps of 8 provinces of Central Russia (Tver, Vladimir, Nizhny Novgorod, Simbirsk, Ryazan, Tambov and Penza) shooting A. I. Mende. At present we have completed the formation of a resource for the maps of 5 Volga provinces (Tver, Vladimir, Yaroslavl, Simbirsk, Nizhny Novgorod). It has made it possible to create complex raster electronic maps that can be used both in professional GIS (Panorama, MapInfo, Quantum GIS, and so on) and specialized mapping applications (Google Earth, CAC.Planet) and Internet browsers (www.boxpis.ru). Such generated resources on archival maps of Russia can become an integral part of Internet resources of libraries, archives (for example, www.rgada.info/), universities, research communities (RGS, the Society "Znanie", and so on). The proposed approach allows to create data resources that expand opportunities of access and automated use of complexes of archival cartographic works in the scientific, educational, administrative and reference purposes. The research is being conducted within the grant RFBR №14-06-00282 A.



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**Reconsidering accuracy in an era of ubiquitous cartography**

Francis HARVEY (Germany)

With mapping possibilities now regularly in the hands of billions of consumers and prosumers, the ubiquitous production of maps, which goes hand-in-hand with ubiquitous computing, faces many accuracy challenges. While GIScientists, cartographers, and most institutions involved in the creation and use of GI understand approaches to assure sufficient accuracy for the tasks at hand, it is a monumental challenge for ubiquitous cartography. Widely available geographic information opens unlimited possibilities for map makers with all possible levels of scientific knowledge. Accuracy, a central concern of GIScience and cartography, is still often little understood and even frequently misunderstood by many users and creators of maps. For maps to be useful, regardless of the medium, they must provide a reliable correspondence among experiences, knowledge, measurements and expectations for a use. In other words, the quality of a map is always a question of its accuracy in relationship to its use. It is a matter of understanding its use in terms of goals and intents not just a specification. A concept of quality that considers source, object and subject alone provides helpful measures to assess the ability of the cartographic means to potentially achieve defined goals and intents and measurable through observation of cognitive process surrogates. Whether the map quality is sufficient for a use is still another matter, for this depends on a broader understanding of the use of the map in cartographic communication that focuses less on the transformation of information into effective visualizations and more on the effects of using the map: a low accuracy map may posses a higher degree of quality for a given use than a high accuracy map for the same use. This apparent contradiction imperils the reliable use of geographic information (GI) and calls for research to make GI fit for use in a post-GIS era of ubiquitous cartography. The starting point of this paper is a review of what constitutes accuracy and quality in terms of a cartographic models of communication presented by Board, Koláčny, and others and critiques of Freitag, MacEachren, Gärtner, Poore and Chrisman and others that these models lack a robust consideration of social aspects of communication. Following Everett, Hutchins, and Capra, this paper lays out a framework for a more comprehensive model of cartographic communication and geographical reasoning. This model integrates considerations of cognition and culture following the concept of language as cultural tool that emphasizes the discursive communication of meaning in geovisualizations in terms of intentionality (Searle), choices, values and responsibilities. Following considerations of what constitutes central concepts of GI accuracy in GIScience and cartography, the paper develops a tentative proposal to guide future research into what constitutes accuracy and fitness for use as matters of intentionality that arise in conjunction with a specific use. The paper concludes with a discussion of the challenges in formalizing this cultural/cognitive model and implementing semantic reference systems that can also be accessible to billions of map users around the world.



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## Comparative analysis of global geoid models by geodetic data

Vera LUGOVSKAYA, Balis SERAPINAS, Askar ILYASOV (Russian Federation)

Satellite leveling is widely used in modern geodetic techniques in order to receive normal heights. In the course of study and survey at the proving grounds of the MSU Geographical Faculty's research base stations heights of quasigeoid above WGS84 and PZ-90 ellipsoids were obtained. Comparative analysis was carried out using heights of the EGM-2008, EGM-96 geoids and RGG-2000 quasigeoid. Krasnovidovo, Satino and Khibiny research stations of the Faculty of Geography of the Lomonosov Moscow State University were chosen as the case study areas. As part of the work the genesis and structure of gravity models were considered. Models-based surfaces of gravity anomalies and resulting residual surfaces of data deviations were constructed for the three case study areas investigated. The results were compared and the accuracy evaluation of calculated data was carried out. Obtained results can be used for scientific and educational purposes at these territories for geographical researching by the satellite leveling when accuracy of compilation survey is different. Received spatially distributed information on anomalous deviations of quasigeoid heights makes it possible to improve the obtained measurements by further research.



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**Online library of reflectance characteristics for objects on the Earth surface**

O.V.TUTUBALINA, N.S.KASIMOV, I.K.LURIE, E.I.GOLUBEVA, M.V.ZIMIN, T.E.SAMSONOV, A.R.ALYAUTDINOV, A.I.MIKHEEVA (Russian Federation)

Libraries of spectral signatures of objects on the Earth surface are a valuable source of information for interpretation of hyperspectral satellite imagery. They become especially important with the increasing availability of satellite and airborne hyperspectral imagery. In creation of spectral libraries it is important to observe a number of principles: - use high quality calibrated measuring equipment, to collect detailed and reliable data; - use of evidence-based and well-documented measurement procedures; - select the most typical objects and their typical conditions, for example, dominant plant species in the main phenological phases; - ensure usability of the spectral library on the Internet. The aim of this work is to create a pilot spectral library based on measurements of plants, minerals and rocks, conducted in expeditions in the territory of Russia. We have analyzed the structure, content and functionality of public spectral libraries. All they are essentially laboratory spectra of minerals, whereas the majority land surface is covered with vegetation. Data collection for the spectral library has been carried out by the authors since 2011, when, thanks to the MSU Development Programme, an ASD FieldSpec3 Hi-Res hyperspectroradiometer has been purchased. It measures radiance and reflectance with the resolution of 3 nm (350-1000 nm) to 10 nm (1000-2500 nm). In 2012-2013 we developed the field measurement proceduresa and collected approximately 200 calibrated spectra, and In 2014, 600 further spectra. The library it is implemented in the form of a spectroradiometric data geoportal within the MSU Geoportal. Spectra of the objects are spatially superimposed on the base maps and satellite images of the area. This study is supported by RFBR, grants 13-05-12061 офи-м, 13-05-00466A, 15-05-0265A.



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**Renewable energy sources as an object of GIS mapping**

Yu. RAFIKOVA, B.A. NOVAKOVSKIY, S.V. KISELEVA, A.I. PRASOLOVA (Russian Federation)

The use of mapping method is an essential part of territorial planning and natural resources assessment. In this case, one of the most popular and rapidly developing application areas of cartography is energy sector. The new energy sources search, regional long-term environmental sustainability and energy security planning puts before GIS specialists new challenges in mapping the energy potentials. Renewables have become competitive and self-sufficient industry in modern power sector over the last decade. They are also interesting as an object of scientific geographical research. Currently accumulated extensive amounts of data, in varying degrees, provide the factual basis for research in the field of renewable energy. At the same time there are problems data verification, interpolation, adequacy analysis production and processing methods, commercially available potential energy calculations and improving the base for choosing factors and constraints that affect the possibility of renewable energy sources use. The authors currently work out on methodological base for renewable energy sources potential assessment and mapping. The approaches to wind and solar energy resource assessment on a regional scale, based on compiling a series of natural and technical capacities maps, as well as the complex factors that affect the possibility of their practical use, have been developed. The special focus was made on taking into account social and economic factors. The result of the proposed methodology approbation is a series of maps for the Volgograd region, which quite completely provides an estimate of solar and wind energy resources at the regional level and allows to select the most promising areas for solar and wind plants siting.



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**The development of geophysical mapping in Russia and abroad**

Dmitriy LOGINOV (Russian Federation)

The geophysical maps are a special kind of maps due to the specifics of the object mapping – geophysical fields – and their values for a wide range of scientific and practical applications. In view of the fact that GIS technologies are rapidly evolving, geophysical mapping methods need to be improved based on previous experience of cartographers and other specialists and historical development of geophysical mapping in Russia and abroad. The author has done an analysis of geophysical maps content, including national and regional atlases. The research allowed to making definite conclusions about the current status and importance of the geophysical mapping in the world. Most often, gravity, magnetic, thermal fields and the field of seismicity (shown on seismic maps) mapped on the global and regional level. Maps of other geophysical fields either completely absent (electric field maps) or a very rare (radiometric field maps), because this fields are most effectively study at the local level. In most of the studied national atlases geophysical maps constitute a special section «Maps of the geophysical conditions» are often placed at the head of nature maps, which confirms the relevance of these maps for studies of natural conditions and resources of the territory. The continuous nature of geophysical fields' propagation frequently defines using of isolines and color scale for its display. Despite this similarity, in practice of geophysical maps mapping and design in Russia and abroad there are certain differences identified by the research.



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**Atlas mapping as a tool for conservation of unique internationally significant ecosystems (on example of the Valley of the Geysers in Kronotsky Reserve)**

A. ZAVADSKAYA, V. YABLOKOV, D. PANICHEVA (Russian Federation)

The Valley of the Geysers in Kamchatka, Russia, is one of the five largest geyser fields in the world, and the only one in Eurasia. Outstanding esthetic values as well as the rare biological and ecological features of the Valley's ecosystem attract thousands of tourists and scientists from all over the world. However, complexity of the Valley is not yet fully understood, as prior research has focused primarily on specific species or habitats, rather than linkages between different components of the ecosystem and spatio-temporal dynamics of natural processes. The Atlas of the Valley of the Geysers became the first attempt to show the complexity and extreme vulnerability of the ecosystem of the Valley and to put all the collected information about the area into one set of maps, understandable and useful both for public and scientists. To create the Atlas our team collected and integrated information from different databases, archives and papers, digitized and actualized existing maps, consulted specialists and rangers, and during 2009–2014 conducted their own detailed ground studies. As a result set of more than 80 full-color maps, 3D models and charts, 100 photos as well as essays by leading researchers of the area, brings together for the first time information about relief, geology, climate, landcover, vegetation, threatened plants, soils, natural dynamics of the landscape; international significance, history of discovery and modern use; recreational durability and relationships between different components of the ecosystem. Using the Atlas, many types of users can access, view, and analyze diverse information about the Valley of the Geysers and its features to better understand the uniqueness, vulnerability and necessity to conserve this outstanding ecosystem. The research was supported by the Russian Geographic Society and the Russian Foundation for Basic Research (projects 13-05-00870, 15-04-03818, 15-05-07002).



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## Regional SDI geoportal to access geospatial data and services for complex analysis of climate changes

Alexander TITOV, Evgeny GORDOV (Russian Federation)

At present geoportal is considered as an Internet gateway integrating web services and other tools for metadata handling, geospatial data search, access, dissemination and processing, and cartographical visualization. According to general INSPIRE requirements to data visualization geoportals have to provide such standard functionality as data overview, image navigation, scrolling, scaling and graphical overlay, displaying map legends and corresponding metadata information. It should be noted that modern web mapping systems as integrated geoportal applications are developed based on the SOA and might be considered as complexes of interconnected software tools for working with geospatial data. Within the framework of regional climate change research projects the thematic geoportal basic prototype was developed based on the geospatial services for analysis, processing and integration of datasets obtained from various sources. At the moment the geoportal prototype hardware platform represents two computational nodes, along with 96 Tb data storage system. According to SDI concepts the geoportal prototype for regional climate change research support is based on modern ISO/OGC geospatial data and metadata services standards as well as approved open source software. Distributed architecture implemented allows adding new remote computational nodes as well as data storage systems. Geoportal web mapping client complies with INSPIRE standards requirements and provides computational geospatial service calls required as well as represents result data in graphical (PNG, JPG, GeoTIFF), vector (KML, GML, Shape) and digital (NetCDF) formats. Thematic geoportal prototype has shown its effectiveness in the process of solving real application problems and disseminating investigation results in cartographical form. The work was partially supported by RFBR grtant 13-05-12034 and Basic Research Program VIII.80.2.



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## "Concept and program of the Atlas "Great Altai: the Nature, History, Culture" on the basis of means of GIS

I. ROTANOVA, V.S. TIKUNOV (Russian Federation)

"Atlas of Great Altai: Nature, History, Culture" is an interdisciplinary unique cartographic model that is being developed by an international team of scientists. The main objective of the Atlas is to ensure the maximal possible access of the international community to reliable, current, and accurate spatial information on the transboundary Great Altai region for its effective development. The internal unity of the Atlas is ensured by comparability, complementarity, and linkage of the sections and individual maps, appropriate choice of projections and scales, a single approach to cartographic generalization, a coherent system of symbols, and a common design. Mapping will be performed at three levels of aggregation of information: analytical, integrated, and synthetic. The analytical maps will enable the isolation and rendering of individual and the most important properties and/or characteristics of objects and phenomena of the mapped territory from an array of numerous features. The integrated maps will render not only multifaceted (polythematic)\characteristics of the region, but will also help to analyze and explore relationships, interactions, and dynamics of covered objects and phenomena. The synthetic maps will rely mainly on the integration of a number of individual parameters and will allow obtaining integral characteristics of the mapped objects, reflect typological zoning, isolate clusters, and present the results of mathematical-cartographic modeling. The title of the main sections of the Atlas correspond to the names of the Atlas title: Nature, History, and Culture. The GIS-component of the Atlas will allow assessing the natural, economic, social, and demographic situation in the Altai transboundary region and could serve as a basis for the subsequent creation of a permanent geoinformational monitoring system available for use over the Internet.



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**Creation of information mapping retrieval system of the dating determinations for alluvial deposits of Russian Federation.**

Andrey PANIN, Ali ALYAUTDINOV, Nikolay SEMIN , Ekaterina MATLAKHOVA (Russian Federation)

The main purpose of the research is creating community access information mapping system of dating of sediments, realized in the form of specialized services based on geoportal architectures. Developed information mapping retrieval system will include data obtained by the original method of determining the dating of alluvial deposits, created at the Department of Geomorphology of the Faculty of Geography M.V.Lomonosov Moscow State University. The originality of the source data together with the latest geographic information and network technologies will create a comprehensive scientific product open to a wide range of users. Methodological approaches implemented in the system are in the modern trends of the global geo-information community. Within the project it was analyzed 150 published sources to pick absolute dates on alluvial and associated (floodplain peats, slopewash loams within erosion forms) deposits. After filtering out some 10% of unreliable dates, 1170 radiocarbon and luminescence dates were included into the date base. Each date was supplied with basic information on geographic location, geomorphological position, catchment area (as classes divisible by 10), characteristics of geological section and dated materials. Documented sections refer to fluvial forms in a wide range of catchment sizes from <1 $km^2$ to 120,000 $km^2$ at lower Vychegda River and 410,000 $km^2$ at lower Don River. In the data base catchment areas are presented as classes from 0 to 6 at intervals with a 10-fold increment: 0 – $10^o$ - … 106 $km^2$. The "zero class" (area <1 $km^2$) refers to gullies and small valleys with ephemeral flow that are termed balka-valleys, or balkas (they have vegetated bottoms which distinguishes them from arroyos, wadi and similar forms in arid regions). Balkas in steppes have catchment areas in the range $10^o$-$10^1$ $km^2$, while catchments of the same size in the forest zone with humid climate belong to valleys with perennial flow. The main advantages of the system are openness and availability to wide list of users, which, together with an integrated system of data quality control, will provide a significant scientific product. This product can be used not only for scientific and educational purposes, but also for a wide range of practical problems.



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**World Ocean floor geomorphology in the general geomorphological map of the World**

V.I. MYSLIVETS, S.A. LUKYANOVA, G.D. SOLOVIEVA (Russian Federation)

In geographic mapping of the sea floor, the isobath method and numerical relief models are predominated. Both of them show the outer features of the underwater relief. But genetic approach (morphostructural and morphosculptural) is also used. As an example, it is represented the Geomorphological Map of the World Ocean floor, compiled and released in 1988 on geographical Faculty of the Lomonosov Moscow State University, Russia. It is proved the importance of morphostructural approach to the classification of the seafloor relief, because underwater conditions are better preserved features of its primary tectonic origin. By types of the Earth"s crust and the relief peculiarities it has been allocated 4 major (planetary) morphostructures: submarine continental margin, ocean floor, transitional zone from the continent to ocean floor, mid-oceanic ridges. Each of these the largest morphostructures can be consistently subdivided on morphostructures of lower-order -1st, 2-nd, ets. ranks. All of these morphostructures make up the core content of the legend to the map. The area ratio of the largest morphostructures is represented. The map shows also the 22 varieties of individual forms of underwater topography, including elements of exogenous origin. Geomorphological (morphostructural) map of the World Ocean floor, compiled in association with Geomorphological map of continents, gives an idea of the general regularities of the Earth"s relief structure, as a whole.



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## Design of multidimensional geographical models

Ludmila USHAKOVA, A.G. KOSIKOV (Russian Federation)

Modern geographical research use different methods of 3D presentation for visualization of multidimensional data models, that improves the perception and enhance the readability of the large information capacity models. Using three-dimensional visualization in GIS allows creating the illustrative spatial models and shows the objects of complex structure. Currently, special importance is the development of principles and methods for design of spatial geographical models, which, based on the achievements of the traditional cartographic design of two-dimensional electronic maps and geoimages, should take advantage of 3D visualization to create an intuitive, easy to read, the most realistic 3D maps, providing high recognition and detail of objects in a special way organized 3D user interface for data analysis and processing model. The aim of this study is to highlight the most successful approaches to the design of multi-dimensional geographical models in their volumetric visualization based on the analysis of modern variants of map design of three-dimensional geographical models and new types of hardware for 3D data volume rendering. The study analyzes the ways of 3D representation of spatial data in the modern graphic packages and GIS, and discusses the possibility of using the latest stereoscopic, volumetric and holographic surround playback devices to improve the design of multidimensional geographical models.



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**Development of the Internet GIS System of Long-term Small Area Population Projection for Japan**

Takashi INOUE (Japan)

The purpose of this paper is to develop the internet GIS system of long-term small area population projection for Japan using a new method of stabilizing small area demographics. Although the cohort-change rate and the child-woman ratio are at least required for population projection, these two indices can hardly be stable when they are calculated for small areas. Instability of them often yields extremely large population especially in long-term population projection. In order to solve this problem, the author proposed a new method of smoothing small area demographics using population potential presented by Stewart in 1947. The new method is to obtain stable values from weighted moving averages based on the concept of population potential, that is, the weight of an adjacent area is in proportion to the population of the area and is in inverse proportion to the distance to the area. The internet GIS system newly developed provides estimated small area populations by sex and by 5-year age class for the whole Japan in 2015-60. All users can download such population data and illustrate maps on the distribution of population increase rate, elderly population rate, population density, and so forth. In addition, the system can be available worldwide because its interface is produced in English as well as in Japanese.



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# Modeling technique of relief morphometric parameters in the ecology-geographical studying of catchment basins

Maria SAKIRKINA (Russian Federation)

This study is dedicated to the development of efficient methods for modeling terrain, providing the solution of problems of different scales of ecological and geographical research. A system of quantitative morphometric analysis methods of relief was developed. Also it includes the methods of detection and analysis of DEM errors. The developed methods are applied to ecological and geographical research of test plots area. The study used GIS technology and mapping method. In this paper we tested the algorithm of landforms transformation due to changes in the slope area, then created a geodatabase of the territory of the test sites. The initial data were topographic maps and remote sensing products. The algorithm was implemented in geoinformation environment and we compose technique of mapping morphometric characteristics. Also was used the technique of predictive mapping changes landforms due to the local characteristics of slope provided spatially homogeneous precipitation, soil and vegetation conditions. The results are stored in a pre-designed geodatabase. In the work we created maps of watersheds, slopes and changes landforms, landuse of test areas. After that we analyzed the distribution characteristics within the watershed. Data analysis allowed us to determine violations within the water protection zone which established pursuant Federal law about guard of water resources of Russian Federation. In addition we determined the landuse in areas with slopes greater than 3 deg, and in the border of material demolition\ accumulation.



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**Russian science and educational geoportals: an overview**

Alexander KOSHKAREV, Irina ROTANOVA (Russian Federation)

In implementation of SDIs components of different levels and functions play an important role geoportals, providing access to spatial data sets and network services, data search by metadata and their cartographic visualization. Discussed the idea of creating an academic SDI (ASDI) and its implementation in practice of scientific research among institutions of the Russian Academy of Sciences (RAS) and geography departments of the Russian universities. Geoportals and other SDI components are developed in a number of institutes of the Far Eastern Branch RAS; among them Institute of Volcanology and Seismology, Northeastern Interdisciplinary Research Institute and Pacific Institute of Geography. Out of the works of the Siberian Branch of RAS the geoportal of Institute of Computational Mathematics and Mathematical Geophysics should be noted. Web-services operate at the Institute of Computational Technologies, Institute of Monitoring of Climatic and Ecological Systems, Institute for Water and Environmental Problems. Also geoportals and online services of Institute of Geography of RAS, Computing Center of RAS, Geophysical Center of RAS, the Arctic and Antarctic Research Institute have been developed. Here are a few examples from education, including Lomonosov Moscow State University, Institutes of the Irkutsk Scientific Center of RAS, Tver and Altai State Universities. There are other examples that illustrate the thesis that science has been the main source of thematic spatial data. Scientific and educational infrastructures and their components are created by universities and academic institutions or their associations to serve their information needs in the subject areas covered by the Earth sciences, in the part that relates to the field of spatial data and associated services.



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**Geoinformational modeling of the current state of vegetation cover of a region**

I.N. VLADIMIROV, A.P. SOFRONOV, A.A. SOROKOVOY, D.V. KOBYLKIN, A.A. FROLOV (Russian Federation)

An original technique of spatial analysis of the vegetation cover state in a region with the use of regular grids and remote sensing data of high spatial resolution has been developed. The NDVI and NDWI were calculated based on multispectral data (Landsat 5 TM). To process and analyze the index values, and to identify objectively the features of spatial confinement of plant communities, digital elevation models were built on the basis of the SRTM data with a regular spacing of 30 m, which corresponds to the spatial resolution of Landsat 5 TM. The slope steepness and exposure were calculated from the altitude using the grids obtained. All the data obtained in the form of regular grids (altitude, slope steepness and exposure, NDVI and NDWI values) were converted to a vector format and represent an array of regularly distributed pixels. Based on the developed technique, the main structural patterns of vegetation cover were identified within the key site (Verkhneangarskaya intermountain basin), and a map of the modern vegetation cover was compiled. The structure of the map legend rests on the principles of multi-level classification of vegetation developed by V.B. Sochava (1979). A classification unit in the legend is a group of associations, uniting, with some exceptions, communities according to the similarity in the species composition of edificators for the layers of vegetation identified in a community. A double-row classification system involves uniting of plant communities on the basis of the principles of homogeneity (similarity) and heterogeneity (difference).



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# C12.13 Geography of Governance

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- State Capacity for the Economic Re-territorialization in China since the 1980s

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**Development, spatial planning and governance**

- Intensive Use of Industrial Land and its Spatial Differentiation in Guangzhou from Sector-based Perspective

  *Chang-Dong YE (China)*

- The role of institutional support as factor of industry location on the example of Germany and Russia

  *Ekaterina ROMANOVA (Russian Federation)*



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## The Administrative Region and the Territorial Structuring in Romania

*Ioan IANOS, Irina SAGHIN (Romania)*

The ratio between the administrative region and the structuring of space is a complex one, marked by the territorial dynamics during the implementation of the strategic objectives of the communities. The purpose of the communication is to check the assumption that the administrative region is partly the result of a self-organisation process, but also a fundamental tool in its organisation at the macro-scale level. In such a demonstration, the regional and pseudo-regional existing configurations, in their great majority, should be taken into consideration as a result of the territory's historic evolution. How can the administrative regions become real tools in a future territorial structuring? Through them focusing on the great settlements systems where the national growth poles are able to provide regional services, and by diminishing the Centre's power. Two dangers are readily ascertainable: one, that the new administrative centre of the region might lose power not in favour of the new structures, but of the next level (the counties), and the second, that the national centre-periphery imbalance might transfer to the regional level. The regional macrocefalia might represent a setback in the pursuit of the region's true role as tool in the organisation of space. This would be evident in the case of many current development regions, if they would become administrative regions. It's about increasing the capacity of the administrative regions in the optimal structuring of space by choosing as future residences of the regions medium sized towns with an important centrality and a development potential. Major regional cities would keep the economic functions and services, and would develop as true regional metropolises, without generating an increase in the intraregional gaps.



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**The multi-scale new area strategy in transitional China: Evidence from Chongqing Liangjiang**

*Lingyue LI (China)*

China's national new area strategy, initiated in the new political and economic milieu, is multiscale in nature and involves multi-level governance in its development. This presentation explores Liangjiang new area development in Chongqing, the fast-growing metropolis in Midwest China, and specifically investigates, using a multi-level framework of rescaling theory, how local government acts and how the institutional structure and intragovernmental relations evolve in different development stages to cope with the restructuring of the economic functional area. The zoning of great Liangjiang and the rezoning of small Liangjaing suggest that the municipal government is the key nexus bridging the multilevel governance framework and that the new area administrative committee plays an essential role in the actual process of power reshuffling from central, municipal to district governments. It is, therefore, argues that the multilevel national new area program, essentially, is a bottom-up approach for local government to articulate state-directed vision and to secure economic growth and competitive advantage of the local per se; that a meso-perspective, highlighting agencies at municipal level, towards the analysis of new area development assists an in-depth understanding of the underlying mechanisms of local development in China; that new area research should concern more on the power rescaling at sub-local level where the pre-existing interest groups greatly hamper the re-integration strategy; and that a holistic approach, not only integrating resources in master plan or economic development but also reorganizing administrative structure to cope with the changing functioning, is necessary for a better performance of new area.



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## Intentionally territories of risk and the government's responsibility to reduce indices of homicides

*Erica FERRER (Brazil)*

Crime and insecurity are a major concern felt in cities. This fear has been handled by public security companies, real estate agencies and government programs to generate profit and votes. However, such collective insecurity must be brought to the scientific community to be studied factors which cause the increase in homicide rate, for example. The lack of infrastructure in this study is shown as a cause of this increase, but the government has this knowledge and, in many cases, do not apply. Thus, the concept of intentionally risk territory aims to propose a reflection on this government neglect in certain areas and the large investment in infrastructure in other regions. Also discusses the motivations that may lead the government to not drive public policy in certain territories with social risk. In discussing public safety must be observed that there is an intention to maintain certain territories safer than others. Therefore, the responsibility exists when the political decision is omitted in the spaces with poor population and acts in the spaces with rich population (or in areas where it has economic motivation). Therefore, the State must take responsibility for the consequences of this omission. That is, high homicide rates in certain territories are direct responsibility of the State. In this study are analyzed three neighborhoods of the city of Rio de Janeiro and three administrative regions of the Federal District, both located in Brazil.



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## State-Space and Urban-Regional Development in China

*Roger C. K. CHAN (China)*

This paper sets out to review the processes of urban transformation and the rise of urban-regional new districts in coastal China. Urban new districts manifest the urban transformative strategy that promotes urban sprawl. The emerging urban-regional milieu offers a reinterpretation of China's reform economy and to revisit the state-space relations in the globalizing context.



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**City-region as a 'soft space' for spatial planning. Between local policies and metropolitan governance in the Poznan urban area**

Łukasz MIKUŁA (Poland)

Urban development in the countries of Central and Eastern Europe requires coordinated, multi-level and efficient management. However, the transformation of the state from the centralized hierarchical planning system to the new territorial model of public sector with strong autonomous local and regional governments has not always been completed. In case of Poland, there is still a serious gap between poorly defined by law metropolitan planning of regional self-government and local planning, based on the principle of municipal autonomy. The aim of the paper is to present the development of new metropolitan planning instruments in the Poznan city-region as an interesting example of planning for 'soft spaces' based on political consensus and voluntary cooperation of municipalities (see Haughton et al. 2009, Faludi 2013). The most important elements of this planning, such as residential, commercial and industrial zoning, public transit, road infrastructure and supra-municipal public services are main issues for negotiation between local, metropolitan and regional actors. And another question under discussion is the mechanism of participation of different local units in the costs and benefits of metropolitan projects.



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## Suburbanization & Czech Spatial Planning: Opportunities And Threats For The Development Of Czech Towns And Municipalities

*Zdeněk OPRAVIL (Czech Republic)*

In the post-socialist countries in Central Europe, especially in the last 20 years, suburbanization has become an important process, which significantly influenced the shape of municipalities on the hinterland of large cities. Suburbanization is the process of building, population, functional, and infrastructural expansion of the city into its hinterland. The changes concern not only morphological structures of the municipalities, but also the functions of a municipality's newly started filling (development of public facilities and services). After this period of time we are able to identify positive and negative impacts of suburban development in various municipalities, including the assessment of the role of local actors (in terms of local governance), who represent a key role in the development of the municipalities. The paper is focused on the issue of suburbanization and the construction of new residential areas in the hinterland town of Olomouc. The main objective of this paper is present the most important aspects that have had an impact on new residential construction in the minicipalities in the hinterland town of Olomouc. At the same time, the contribution tries to answer the question of how local governance affect the overall urban form, including the overall development of the minicipalities. Pat of the paper is also evaluate the use and impact of basic legislative instruments Czech spatial planning and their use in practice. The contribution is also dedicated to the identification one of the biggest problems of the Czech spatial planning in the context of the construction of a new residential development and possible tools that would be able to regulate, respectively preventing the consequences of suburbanization.



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## Enhancing Local Problem Solving: Governance Structures and Networking in Russian "Twin Cities"

*Ekaterina MIKHAILOVA (Russian Federation)*

The paper explores attempts to apply cross-border governance concept at the municipal level using adjacent settlements as an example. To do it, the author investigates the way of putting forward integration initiatives in different border contexts. The cases under the scrutiny encompass three city pairs along the Russian border that call themselves twins (Nikel-Kirkenes on the Russian-Norwegian border, Svetogorsk-Imatra on the Russian-Finnish border and Blagoveshchensk-Heihe on the Russian-Chinese border). Thanks to the comparative character of the research, the author defines stages of cross-border cooperation that serve as a prerequisite for emergence of cross-border governance thinking. Besides this, the paper proposes the mechanism of managing cross-border flows through balancing driving forces for crossing the border. The afore mentioned mechanism is interpreted as a tool of territorial development and requires joint efforts from both sides at various levels. Given that some twin cities initiatives are more visible at the regional and/or national level, the article contains the set of recommendations for municipal, regional and national authorities to improve the success of twin cities initiatives. Theoretical framework of the paper is build on constructivism approach and follows understanding of twinning as a social experiment. From methodological point of view, it comprises extensive fieldwork in selected city pairs, as well as analysis of documents and secondary sources.



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## Modelling Palembang City Development Direction, In 1994, 2006, 2013, And The Correlation With Goverment Policy

*Muhammad Wafiq (Indonesia)*

The development of settlements and buildings for industry and services is an essence for a growing city. Remote sensing capabilities to distinguish objects land cover can be used to determine the changes that occur in time and then calculate the area of developed land. Landsat image classified by the maximum likelihood method will produce Palembang City land development in 1994, 2006, and 2013. The results obtained are Palembang development area growth of 17.56 km2 in the year 1994 to 2006 and a growth of 61.93 km2 develpment land in the year 2006 to 2013 so that the accumulation growth of development land n 1994-2013 is 79.49 km2. The direction development affacted by some of policy that made by goverment and big development by private sectors. Direction of development is heading north of Palembang City to the border with the Musi Banyuasin Regency, where the area has an association with an international airport development policy in 2009. Meanwhile, the southern area is less developed land because the majority of the land is consist of swamps and having flood risk in rainy season.



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## Urban reforms: A case for inequity

*Bidisha CHATTOPADHYAY (India)*

Jawaharlal Nehru Urban Renewal Mission was launched by the Government of India in 2005. It was envisioned as part of the larger vision of commitment to attaining the Millennium Development Goals. It was also the outcome of a need to improve the quality of infrastructure and thereby, ready the cities for economic activities emerging out of the neo-liberal economic policies. The Mission released reform linked grants for improvement in infrastructure through projects. Nine years later, the cities and the states exhibit varying levels of performance in both implementation of reforms and projects. In 2014, the Government declared that fund release shall be linked to the past performance level of the cities. This has severe implications for the cities which have not performed well as they will face further deterioration. In this context, it is important to understand the reasons for under-performance and devise policies and methods for assisting these cities so that they can be brought at par with the well performing cities for a more equitable urban growth. The present paper focuses specifically on the municipal level reforms. The performance levels have been studied vis a vis factors like the political regime, levels of development, history of past projects etc. The findings suggest an association between levels of development and the performance levels reiterating the need to provide the poor performing cities with special assistance.



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## Deepening Democracy and Local Developmet-The Case of Kerala

*P P BALAN (India)*

Deepening democracy means making democracy relevant for the people. It is continues process with focus on working towards a participatory and inclusive democracy and also building a strong public sphere. Kerala the southern state in India has shown that decentralized governance is more than balloting. Kerala has made historical achievements by entering in to a new phase in its democratic decentralization by experimenting decentralized planning with peoples participation. The decentralization process of Kerala has been widely acclaimed by the people from all over. A new methodology of decentralized planning has been evolved. The local self government institutions have been strengthened by means of devolving Functions, Functionaries Finances (3F). Grassroots institutions have been strengthened and new institutions such as Grama Sabha (village Assembly) has become the forum for direct democracy. Decisions are taken in the Grama Sabha and a bottom up planning process has been developed. Transparency and accountability systems are put in place. Social Audit has also been introduced in the system. So in governance there is abundant scope for people's involvement. This Kerala model of decentralization has become a role model for the other Indian states and south Asian countries to emulate. Since there exists no such modal elsewhere the entire process is based on 'learning by doing' approach. Based on this new reforms are also introduced. In fact the cynicism that had existed in the State regarding governance has been disappeared and a new enthusiasm for good governance has been seen every where.



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# Regional legislation as an institution of regional development in modern Russia and the role of legal geography

*Olga GLEZER (Russian Federation)*

Regional legislation appeared in Russia only in 1993 according to the Constitution, as a consequence of the real federalization of the country. More than 170000 regional laws have been accepted, to date, but legal processes as a specific research subject have deserved almost no attention from Russian geographers. Meantime, regional laws can not ignore the natural, socioeconomic, cultural, historical, and other regional and local features and reveal spatial heterogeneity. That is why legal geography can contribute to the analysis of environmental, demographic, social, economic, geopolitical, and other conditions at different territorial scales. Number of laws of independent legal regulation varies four times in different federal subjects of Russia, from less than 400 in some North Caucasus republics to more than 1500 in large Siberian regions. It is necessary to develop a methodology and methods of legal geography. The main tasks are monitoring of regional legislation, its typology by different issues, thematic issues especially, and interrelationships among the environment, population, and socioeconomic institutions in the regions. It is impossible to visit regularly all regions in such vast country as Russia, so regional laws can provide adequate data about the processes and conditions, together with statistics, Internet and other media information, and visual observations. Legal geography can enrich many areas of geographic inquiry as well as contribute to current policy of legal regulation of spatial development.



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## Focusing on the major function-oriented zone: A new spatial planning approach and practice in China

Jie FAN, Chen DONG, Guo RUI, Wang YAFEI (China)

For a long time, China has been focusing primarily on pursuing economic growth, with less concern about social and environmental development issues. This may make China's development unsustainable. In contrast to its current economic-oriented approach predominated by economic growth, this research note presents a newly proposed approach of 'major function-oriented zone' (MFOZ) that is designed by our research team and is largely accepted by the central government and incorporated into its 12th Five-Year Plan. This approach tries to rationalise China's regional development and insists that each region should have its unique functions to perform, determined by its own characteristics, conditions and requirements. With this approach, the central government is able to monitor and coordinate regional and local developments, and hence the'Planning of MFOZ' is seen by the central government as a tool to steer spatial arrangements for the country's long-turn sustainable development.



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## The problem of identification and delimitation of "resource regions" for the purposes of regional policy

Alexander SHENDRIK (Russian Federation)

Many papers in economic geography and regional economics devoted to Russia traditionally reveal the problems of resource abundant territories and regions which economic development is dependent on exploitation of natural resources. Various terms are used to define such territories: "resource regions", "regions of resource type", "natural resource territories", "raw material territories", "frontiers" etc. Each paper usually focuses on specific problem or specific industry. Therefore, there is no common criteria that we can use to clearly identify some area (territory) as a "resource region". Moreover, such zoning always involves the problem of scale and delimitation. At the same time authors of papers in development and resource economics widely use such terms as "resource economies" and "economies of resource curse" with reference to countries and regions that face the problems of high risks and instable economic performance caused by their international resource specialization. This presentation focuses on analysis and comparison of foregoing approaches. Clarity of terminology and resource regions' criteria we use at different scale levels are particularly important for the purposes of regional policy. Key words: frontiers, natural resource territories, resource regions, resource economies, resource curse



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## Spatial governance and Local Response of Industrial Development^ the rise of the Computer Industry in Chongqing

Boyang GAO (China)

In recent years, China's spatial governance has continued to evolve and revolve around the "bottom-up" approach. The government's spatial governance strategies have profound influence on the region's development. China's political administrative structure is such that various levels of government possess different degrees of power and autonomy. Thus, the degree of competition and cooperation between these governments differ according to their governmental interests. Since China's reform and opening up, the central government has largely relaxed its jurisdiction and control over local governments in an effort to promote decentralization. This allowed local governments to carry institute political reforms within their jurisdiction in areas such as taxation, land, labor, and other factors. At the same time, local governments also actively seek out special benefits from the central government in hope of attaining more autonomy to execute and experiment groundbreaking reforms to local policies. This paper focuses on the political relationship between the central government and local governments and the latter's ability to enhance spatial governance through instituting reforms within their political framework. Using the development of Chongqing electronics information industry as an example, the paper analyzes the influence of government policies on local industries. As a centrally administered municipality, Chongqing made use of its "strong government" political resources and administrative capacity to obtain numerous Special Administration platforms from the central government. Using these platforms and benefits, the municipal government instituted drastic reforms in many areas including changes to the household registration system and land system etc. These policies set out effectively laid foundational works in the long run to expand economic markets and continuously promote industrial growth.



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# The Global Control Of Governance Of The Internet By Internet Corporation For Assigned Name And Numbers (Icann) - 1998-2015

Hindenburgo Francisco PIRES (Brazil)

From the antagonic views and asymmetric actors related to Internet governance, the purpose of this research is to answer the following questions: Who are these actors? How is taking the hegemonic discourse? How is production going on dissent in social networks? The objectives of this study are, first, highlight the contexts, the disputes and the discourse by Internet governance in seventeen years of control of governance of the internet by Internet Corporation for Assigned Names and Numbers (ICANN) 1998-2015, second, to demonstrate how it happens, in social networks, the articulation of those responsible for the control of Internet governance actors and, third, to analyze the production of hegemonic discourse to maintain the status quo of Internet governance. To achieve these objectives, we analyze some of the documents produced in the workshops and working groups of the following events: (a) Internet Governance Forum – IGF, organized by the UN and held in Baku (Azerbaijan) from 6 to November 9, 2012; (b) Global Multistakeholder Meeting on the Future of Internet Governance (NetMundial), organized by the ICANN and the Brazilian Internet Steering Committee, held in 23 and 24 April 2014 in São Paulo, Brazil. The discourse of these official documents, resulting from such international events, will be compared with other sectors of social networks linked to civil society and governments that are not being met because, although participants of some of the mailing lists present viable alternatives to Internet governance proposals, the production of proposals that arise in these social networks and forums of international events, has not been included for the effective achievement of multilateral governance. Keywords: Control of Internet Governance, Social Networks, ICANN, IGF, NetMundial.



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## Integrated maritime policy for the Black Sea

Natasa Maria TATUI-VAIDIANU, Ioan IANOS (Romania)

The Integrated Maritime Policy (IMP) seeks to enhance the coherence and coordination of maritime policies across sectors and across borders. The IMP tries to integrate the following cross-cutting policies: blue growth, marine data and knowledge, maritime spatial planning, integrated maritime surveillance and sea basin strategies. Maritime Spatial Planning is intended to become the main coordinating tool under the IMP. In 2014, the European Commission issued a Directive on Maritime Spatial Planning in combination with Integrated Coastal Zone Management. The European Commission is now studying ways in which the IMP approach could be applied to the Black Sea. This paper aims to identify the main maritime assets and to describe the situation in Romania regarding maritime issues (economy, jobs, governance, concerns, environment). Next step in research was to map the stakeholders views in order to get acquainted with some of the key ideas that promote integration across sectors of activity, and to explore what type of support could be provided by the EU. A lot of bottlenecks, gaps and needs were identified: over-exploitation of marine resources and significant environmental decline, lack of public participation and stakeholder participation, lack of a coherent and well-managed network of coastal and marine protected areas, lack of sectorial information exchange. By studying these issues, the paper is able to provide recommendations, practices and tools for dealing with these challenges and with scientific support to policy under high uncertainty, with a focus on marine governance.



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## Governance in national urban policy formation in Slovakia

Jan BUCEK (Slovakia)

Despite important role of cities in Slovak settlement system, there had not existed any compact and well elaborated urban policy. During nineties, there were almost no explicitly spatially oriented policies. There dominated strong sectoral and regulatory approach in shaping policies. Of course there had been strong tradition of territorial planning with whole hierarchy of master plans, and other plans supporting this direction in planning. This situation continued also during first decade of new century. National urban policy at these times had been set of sectoral policies and limited scope of measures applied predominantly in cities. This situation started to change with rising debate focusing on role of cities predominantly in European dimension and within the EU. During preparation of new programming period 2014+, capacities for urban development coordination had been strengthened. There had been identified need for more elaborated national urban policy in Slovakia. In parallel, debate on national report for Habitat III also generated new wave of interest. As a result more ministries started to pay more attention to urban issues and future of cities. With respect to concept of multilevel governance, into the process had been invited numerous actors representing all levels of government, as well as private and non-governmental sector in Slovakia. This effort also induced larger activity in research partially supported by the most involved ministries. Set of important concepts are introduced into the praxis of urban policy. This wave of attention to urban life is promising for better functioning and development of Slovak cities.



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**Multi-scalar State Spatial Selectivity and Variegated Spatiality: a Reflection on China's Hybrid Socialist Market Economy**

Xiaoxia XU (China)

China's transition toward the market-oriented path is a dynamic and hybrid process that cannot be explained simply by the neoliberalism ideology or capital development state theory. With the deepening of the economic reform, the neoliberal logics that have spread broadly at the global and local scales are paradoxical regarding to China's national socialism ideology. This paper aims to develop a framework to explain the cross-scalar spatio-temporal tension of increasing marketization and socialism ideology. It argues the Chinese states' capacity to intervene economic activities is not fade, rather, has been strengthened through state spatial strategies at various scales. Through multi-scalar state spatial selectivity the Chinese states create new boundaries within the territory and channel the capital to certain spatial sites. This process reinforces the state power and lead to uneven and fragmented state spatiality. Market-based policies are promoted by central state and widely adopted at the sub-national scale and supra- national scale, while the central state of China tries to make a balance between rapid economic growth and equal spatial redistribution. This hybrid process leads to reproduction of state spatiality. The paradox of China's Maxist socialism principle and its embarking on the global 'free' market logic in reality produces a more motley state spatiality.



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## Social problems of the indigenous people in the Russian Arctic

*Tuyara GAVRILYEVA (Russian Federation)*

The transformation of the Russian economy has led to a number of negative consequences. The worst situation has formed in the North of Russia, and especially in its Arctic zone. From 1990 to 2013 the population of Yakutia reduced by 15%, in arctic regions – by 53%. One of the causes of migration is the shutdown of large industrial enterprises built in the planned economy. Migration compounded by falling living standards and quality of life. The Soviet authorities provided employment in the industrial enterprises regardless of their financial results, while the northern allowances and supplements ensured a high per capita income with good supplies and social safeguards. Market relations have undermined these social benefits. Poverty is accompanied by the unavailability of housing which construction costs in the Arctic zone 2-3 times higher than in the central part of Yakutia due to transport costs. Optimization of the social institutions network leads to an increase in social problems. Children of small villages are forced to break away from their families for education. 24 people were killed in the crash of the helicopter shuttle which occurred on July 2, 2013 in Ust-Yansky district. Among them there was a young family with two children, one of them was a newborn. Women in labor have to be sent from their settlements to the district centers. It is obvious that in the future industrial and military development of the Russian Arctic will go dot, rotational manner. There will not be significant social investments. Therefore it is necessary to determine the practicability of maintaining the current population in the Russian Arctic. It is necessary to make decisions on the resettlement of the population from depressed settlements to areas with more favorable climate.



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**Impact Of Development Activities On The Tribal Communities: A Case Study Of Tapatoli Gaon Panchayat, Dimoria, Kamrup (M), Assam**

*Rupali Phukan BHUYAN, Dibyalata DEVEE (India)*

Development can be said to be the progression of a society from a simpler or lower to a more advanced, mature or complex stage, regarding their social structure, economic organisation, political status and cultural background. It may also be defined as the gradual advancement through a series of progressive changes of lifestyle. A study on the impact of development activities on the tribal communities (Karbi and Tiwa etc.) of Tapatoli Gaon Panchayat, Dimoria bears immense significance, as the area is situated to the outskirts of Guwahati, and by the side of National Highway 37. During the last decade, some parts of the gaon panchayat are witnessing rapid changes due to development activities which are affecting the villagers in both positive and negative manner. While such a process of change is euphemistically referred to by some as 'development', as these are bringing employment opportunities and some infrastructures, the growth of unplanned activities are destroying the ecological balance of the area The study reveals that the impact of development programmes is rapidly eroding the age-old customs and traditions of the tribal communities. Yet, on the contrary to this, the positive impacts of development activities cannot be ignored which have safeguarded the tribals from exploitation and provided them better living condition including education and health care. The work has been carried out by following data derived from both primary and secondary sources. The primary data collection has been done by stratified random sampling, taking 250 households out of 2721 households of the panchayat.



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# Feasibility of Participatory Rural Governance in the Web of Representative Democracy – a Case Study from India

*Subhra CHATTOPADHYAY (India)*

Since Independence, Government of India has made several efforts towards participatory rural development. Among these, most remarkable is the 73rd Constitutional Amendment (1992) and conferring legitimated power on all rural voters for direct participation in planning, implementing as well as monitoring the development projects within the constituency where they belong. The Amendment Act (1992) provides the Guideline to the States for devolution of functional as well as financial power to the rural self-government in a prescribed manner. Notification was done to amend the State Acts accordingly. Rural self-government has been transformed into three–tiered elected body and election at every fifth year has become mandatory. By this change, all electors gain the right to attend village council's meetings to advice / questioning the elected leaders. Electors are entrusted to prepare, to supervise the village plans as well as to scrutinise the budget in open meetings. The provision of direct participation of rural voters as authorised in the States' legislature is apolitical but the elected self –government itself is represented by the political party. The study aims at investigating the feasibility and utility of such participatory democracy within the frame of representative democracy with case study. It is observed that rural people are not interested to emit their legitimated power for participation. Either they have not much experience or no scope to participate in the 'village plan by villagers' programme. The State induced apolitical participation within the representative democratic structure appears to be doubtful strategy for India. Key words: governance, participatory democracy, representative democracy, rural self- government, village council



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## The Problematic of 'Good' Governance in Globalizing Urban Regions of India

*Aparna ASHOK (India)*

The structural shifts towards denationalization with simultaneous move towards neoliberal form of urban governance have decisively affected the spatial (regional) pattern of urban development in India. The neoliberal notions of urban planning are prescribed to promote 'good governance' assuring 'efficiency, transparency and democratic accountability' through privatisation. Following the same, there have been ambitious schemes proposed in India for urban regeneration following the popular models of urban development like public private partnerships (PPP) transported from Global North. The efforts towards larger incorporation of private sector into urban governance and management have brought in varied and often lopsided pattern of financial investments (development) with reference to regional spaces as well as economic sectors. The already lopsided pattern of economic development thus found to be aggravated leading to sharper socio-economic divisions. The same has brought in several forms of privatisation particularly petty-privatisation activated in bringing in often exploitative obligatory and nongovernmental (land mafias, goons, etc.) forms of governance, administrations and civic responsibilities in first place. Secondly, such type of privatisation is also found to be based on corporate corruption and manipulations that is found to divert the public funds in the interest of affluent classes. Thirdly, the so called 'participatory approach' allows affluent class (private operators and speculators) to become vocal and pressurize the State to exclude masses. The same becomes immensely significant at the backdrop of discriminating socio-economic conditions in India. The neoliberal urban governance, thus, is found to impose extremely exploitative regimes through the nexus of local, regional, international forces. Thus, stark socio-economic and spatial inequalities, spatial imbalance, marginalization and polarization of lower income groups have become synonymous with regional 'development'. The paper will analyse present form of regional governance with specific reference to select city-regions in India. It will also attempt at suggesting an alternate paradigm of regional governance.



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# Influencing factors of firewood consumption of rural household in restricted development zones: a case study of the Nujiang Prefecture in Yunnan Province

*Wei SUN, HU Wangshu, YAN Mei, LV Chen (China)*

The promotion of the development of major function oriented zones by 2020 is a major strategic plan in China and requires collaboration between the government and the public. The solicitation of public support for the development of major function oriented zones remains a great unmet need that has not been addressed by academics. This study used the Nujiang Prefecture in Yunnan Province as an example in performing empirical analyses of the influencing factors that affect firewood consumption based on 654 rural household questionnaires and a logistic regression model. Our results indicated positive correlations of rural household firewood consumption with household size, the existence of migrant workers in a rural household, location of an administrative village in a natural reserve, the location of an administrative village above an altitude of 2000 meters, and the distance from the administrative village to its county town. The probability of rural household firewood consumption increased by 24.20% with each additional person in a household, and the probability of firewood consumption was 67.18% greater in households with migrant workers than in those without migrant workers. The probability of rural household firewood consumption in nature reserves was 3.26-fold higher than that of rural households outside nature reserves. In addition, the probability of rural household firewood consumption was 64.70% greater in administrative villages 2000 meters above sea level than in those at altitudes less than 2000 meters. The probability of rural household firewood consumption increased by 6.12% with each increase of one kilometer in the distance between an administrative village to the nearest county town. Both of these two variables reflected the accessibility of energy sources other than firewood to rural households. Higher altitude and longer distance from the county town led to lower accessibility to alternative energy sources and an increased probability of firewood usage. Our data showed a negative correlation with cash expenses in the previous year, housing conditions, and cash subsidies. The probability of firewood consumption was reduced by 2.28% with each additional 1000 CNY in cash expenditures in the previous year, whereas the probability was reduced by 45.73% for each increase of level in the housing condition. Cash subsidies for rural households reduced the probability of firewood consumption by 38.39%. According to the quantitative research on the firewood consumption, the article discovered various factors which had positive or negative effects on Nujiang Prefecture, these are useful enlightenments on Restricted Development Zones from reducing the firewood consumption, curbing the ecological damages and forest degradation caused by excessive firewood consumption. The article puts forward some practical policy recommendations from environmental protection, finance, population, investment and industrial policy, and hope to improve energy consumption structure and consuming behavior and alleviate antinomies between household energy consumption and ecological protection, and advance the strategy implementations in this region.



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## Spatial Planning of Water Resource Development in Bhutan

*Kausila TIMSINA (India)*

Abstract: Bhutan a geo strategically strained country between India and Chain has a risk of being swamped by one of the mega nations. The threat to the country's independence is intense as it was exposed to external threats for many centuries. The regional stressed environment demanded Bhutan for a cautious move towards its external relation. In apprehensive geopolitical situation, weakening economy and deprived social conditions, Bhutan chose modernization fundamentally as a strategy for Bhutan's independence and survival between powerful nation-states. To initiate modernization and socio economic development, water the only natural resource of Bhutan started to be exploited for hydropower production. To develop the hydropower India became sole assistance to Bhutan. Thus to understand the Spatial Planning for water resource development to create socio economic development the study using a semi structured questionnaire with a snowball techniques would use interview of various government officials in Bhutan and India in the research. Additionally ethnographic and observational techniques will be used to study the process of hydropower development in Punatshangchhu I & II and Tala Hydropower project sites in Bhutan. Analysis of the acquired primary and secondary data will be done by a discourse analysis. The expected result of the study would be that, the study will show how geopolitically strained Bhutan took up modernisation and initiated socioeconomic and natural resources development. Importance of natural resource development to Bhutan. Further the geopolitics of power relation between India china and Bhutan will be understood.



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**Future-orientation municipal waste management planning in Limpopo province, South Africa**

Virginia MUDAU (South Africa)

Municipalities design integrated waste management plans (IWMP) whose primary objective is to optimise waste management services. This allows for higher efficiencies in waste service delivery thereby improving the quality of life of all citizens. Parallel associated environmental impacts and financial costs are in the process minimised. This paper. reports an investigation into the nature of engagement with stakeholders in the context of planning. Using municipalities in Limpopo Province, the data was analysed using Excel based descriptive statistics and frequency outputs presented using applicable graphics. Results show that municipalities with an IWMP are more likely to enhance a conscious relationship with the goals of the National Waste Management Policy of 2008, low levels of compliance as a tool to achieve waste management are noted and, inherent problems of design within the waste management planning system exist. These findings have direct implications for understanding long term planning in municipal waste management systems. Keywords: Interventions, interface, IWMP, optimization, efficiency



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# Evolution of Jobs-Housing Spatial Relationship in Beijing Metropolitan Area: A Job Accessibility Perspective

Jinping SONG, Huiran HAN, Chengfeng YANG, Enru WANG, Meng ZHANG (China)

Following urban expansion and economic restructuring, the jobs-housing relationship has become an important issue in studies on urban spatial structure. This paper employed a job accessibility model, which was an evaluation instrument to measure the jobs-housing relationship in the Beijing Metropolitan Area from a job accessibility perspective. The results indicate that the population in the central city is declining, whereas the population in the suburbs is consistently growing and forming new population centers. However, the distribution pattern of employment is still highly centralized. Job accessibility varies in different locations, but the inner-city areas (within the Third Ring road) have seen improved job accessibility over time while job accessibility in the suburbs (especially outside the Fourth Ring road) has decreased, and this has led it to become a primary area of residential and employment mismatch. At the same time, the new towns in the outer suburbs have not yet demonstrated great potential to attract more jobs. In addition we find that, to some extent, urban planning changes the jobs-housing relationship, but a polycentric urban spatial structure is not yet evident. The floating population and related housing policy also affect the jobs-housing relationship. We propose some measures to resolve the spatial mismatch as well as some future research directions.



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## State Capacity for the Economic Re-territorialization in China since the 1980s

Yun LI, Jianfa SHEN (China)

This research aims to explore the underlying relationship between the territorial economic activity and political/institutional response, the formation process and dynamic mechanisms of the government-led institutional integration process within the cross-boundary region. In order to deal with these questions, the "economic territorialization" and "state capacity" are two crucial notions to understand the conceptual framework, in which the government plays the bridging actor between two meso-networks (i.e. the systematic state community and the intra-territorial network). As one of the defining characteristics of "state", "state capacity" is the ability of a government to administer its territory effectively. It could be described by two aspects: "executivity" and "autonomy". Based on the the discourse of state capacity in China and comprehensive study, it could be found that: (1) the preserved hierarchical government organizations in China suggest that the central authority can still maintain control in the institutional regulation and crucial decisions that dominates the economic incentives, such as the dispersing of state capacity, (2) This provincialization tendency has been intensified since the early 2000s when China entered the WTO and six rounds of the Central Government's abolition and devolution of administrative examination and approval power were put into effect. The provincial units have become the major recipient and beneficiary of the Central Government's downward rescaling (i.e. the devolution of administrative examination and approval power), and the instrumental role in redefining national policies since 2002; (3) With the forming process of the new authoritative structure characterized by the enhanced significance of the provincial authorities, the inter-government vertical links between provincial and sub-provincial authorities has shown an increasing trend. That is, more city-level economy returned to the governing structure led by provincial authority.



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# Intensive Use of Industrial Land and its Spatial Differentiation in Guangzhou from Sector-based Perspective

Chang-Dong YE (China)

New industrialization and urbanization require urban land used more intensively. Industrial land is the key of urban land use intensity. Studies from sector-based perspective will contribute to discover laws of industrial land use intensity and its spatial differentiation more specifically. Based on the data of industrial land-use survey in Guangzhou, this paper builds an evaluation index system including eighteen indexes from five aspects (scale, structure, intensity, distribution, and efficiency), aiming to appraise industrial land use intensity in Guangzhou; the results indicated that the highest intensity sectors include petroleum processing industry, electricity, heat and water production and supply industry; the lowest sectors include non-ferrous metal smelting and rolling processing industry, papermaking and industry and non-mental mineral product industry; industrial land use intensity ranked from high to low as "public goods production industry→high-tech industry→consumer goods manufacturing→chemical products manufacturing→machinery manufacturing". After comparing with other domestic cities or regions, industrial land use intensity ranked generally as "high-tech industry→consumer goods manufacturing→traditional labor-intensive industries". Then, this paper calculated industrial land use intensity in town scale, the results show that the industrial land use intensity spatial differentiation pattern in Guangzhou can be summed in "four rings-two special area"; the intensive degrees of these four rings increase with the distance from the center increased and then decrease farther from the center—low level in central ring, medium level in transition ring, high level in suburban ring, and medium level in exurban ring; two special areas are industrial specialization areas and industrial development zones which have the highest industrial land use intensity, these areas usually distributing in suburban and exurban rings. The study also concluded that sector-specialization of industrial land use, industrial policies and location (land prices) are main factors to industrial land use intensity spatial differentiation in Guangzhou. Finally, evaluation index systems and methods, sector and spatial differentiation patterns of industrial land use intensity have been discussed.



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## The role of institutional support as factor of industry location on the example of Germany and Russia

Ekaterina ROMANOVA (Russian Federation)

In addition to well-known factors of industry location such as proximity to the human capital, the consumer market, transfer costs of materials and goods and institutional support can play crucial role in the decision making process for business too. Using an example of specific Russian and German regions conducted research shows that different forms of government support can determinate such process. Majority of economic regional growth theories referrer to human capital (Becker, 1964, Romer, 1990, Salamon, 1991, Woodhall, 2001) and agglomeration effects as predominate factors (Krugman, 1991, Fujita, 1995, Ellison, Glaser, 1997). Specifically for Russia some researches apply territorial inequality (Mikheeva, 2000, Markevich, 2012). However, poor market and fiscal institutions influence regional development in Russia more strongly than in other countries (Polterovich, 1999, Drobyshevsky, 1995). To increase competitiveness regional governments attract investments through infrastructure development, tax regulations, coordination and advanced financial instruments. Presented analysis shows that in Russia the regional investment policy is constrained by the lack of financial instruments. At the same time a strong hierarchical decision making process suppresses bottom up approach. In Russia western investors cannot count on classical cluster effects. There is a severe lack of middle and small enterprises. German division has "path dependence" negative effect on Eastern German regions too. Even after 25 years of reunion significant differences in regional development still exist. The government strategy of massive financial support yielded limited results; the most nuanced question is how to endure the globalization and demographic desertification in less development regions.



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# C12.14 Geography of the Global Information Society

## Information Society and Quality of Life

**Chairperson(s):** *Mark WILSON*

- An Examination of the Utilization of E-commerce in Business Activities in Remote Islands: Comparison of Ama and Ogasawara in Japan

  *Hiroaki KAMMURA, Kenji HASHIMOTO (Japan)*

- Assessment of Quality of Life Using GIS and Remote Sensing Techniques: A Case Study on Asyut City, Egypt

  *Mohamed Farid Almetwaly Alsaid Ahmed AHMED (Egypt)*

- The Characteristics and Information Acquisition Behaviors of Theater Audiences in a Local City: A Case Study of Hiroshima, Japan

  *Kenta YAMAMOTO (Japan)*

- Software Piracy as a Nation-State Cultural Trait

  *Alexander FETISOV (Russian Federation)*

## ICTs diffusion in space

**Chairperson(s):** *Mark WILSON, Anastasia NAGIRNAYA*

- Frontierity of Information Network: Indexes and Models of Network's Infiltration into New Territories (On Example of the Siberian Mail)

  *Victor BLANUTSA (Russian Federation)*

- Telecommunication traffic diffusion in space

  *Anastasia NAGIRNAYA (Russian Federation)*

- Diffusion of information and communications technology products and "five Russias"

  *Stepan ZEMTSOV, Vyacheslav BABURIN (Russian Federation)*

- Innovation process stages in space

  *Tatiana ACHKASOVA (Russian Federation)*

## POSTER EXHIBITION

- Border Effects Arising at Expansion of Information Network (On Example of Russian Postal Network's Infiltration into China, 1870 – 1920)

  *Victor BLANUTSA (Russian Federation)*



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## An Examination of the Utilization of E-commerce in Business Activities in Remote Islands: Comparison of Ama and Ogasawara in Japan

*Hiroaki KAMMURA, Kenji HASHIMOTO (Japan)*

Recently, the communication environment in the less favored areas of Japan has improved owing to the development of ICT infrastructure through Japanese government's policies. This has allowed the residents and businesses of these areas to better utilize e-commerce. Compared to sales activity in the real space, e-commerce is believed to reduce geographical limits, but the impact of e-commerce on each business is different across industries. We discuss this point using two cases we presented before as a summary of this study. According to our case study, local residents use B2C EC such as Amazon frequently, and the businesses in non-basic industries face severe competition in the less favored areas recently. On the other hand, the businesses in basic industries benefit from e-commerce. However, even in basic industries, the way of utilizing e-commerce varies depending on the type of business. For example, both cases in our survey, Ama town and Ogasawara Village in Japan, are remote islands with a population of approximately 2,300. Ama town has a food processing business linked to its basic industry (primary industry), and it utilizes e-commerce to create sales. In contrast, the basic industry of Ogasawara village is tourism, and small businesses there sell their products to the tourists staying on the island. These businesses utilize e-commerce mainly for material procurement. These examples show that basic industries tend to actively utilize e-commerce, and the way they utilize e-commerce depends on their business models.



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**Assessment of Quality of Life Using GIS and Remote Sensing Techniques: A Case Study on Asyut City, Egypt**

*Mohamed Farid Almetwaly Alsaid Ahmed AHMED (Egypt)*

Urban quality of life (QOL) is becoming the subject of urban research as it is an important component of overall life satisfaction. The rapid growth of urbanization has led to degradation of QOL in many developing countries and most studies of QOL accomplished in an urban or a country level. Also few studies have examined links between objective and subjective indicators relating to urban QOL. The main purpose of this work is to measure QOL using both objective and subjective indicators in Asyut city, which is located on the west bank of the Nile for ~375 Km south of Cairo. Initiation of the city can be traced back to 4000 B.C., while the modern city dates from 1800 A.D. and consisting of 16 districts. Objective environmental indicators such as land surface temperature (LST), Greenness (NDVI), and impervious surfaces (IS) are extracted from Landsat ETM+ images. Objective socio-economic indicators such as GDP, unemployment rate and illiteracy are derived from secondary sources of data. For analyzing data, statistical methods such as factor analysis, remote sensing and GIS multi-criteria evaluation model are used for calculating composite measures of QOL. The main findings of the study reveal the presence of great variability in QOL between the city territories and indicate the importance of studying both subjective and objective indicators. Based on the analysis of the subjective and the objective QOL, the city districts where classified as dissonance, adaptation, deprivation or well-being. Methods and results of this study can be widely helpful for the future urban planning of quality of life in Egypt generally. Keywords: Urban quality of life, Objective and Subjective indicators, Asyut City, GIS, Remote Sensing.



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# The Characteristics and Information Acquisition Behaviors of Theater Audiences in a Local City: A Case Study of Hiroshima, Japan

*Kenta YAMAMOTO (Japan)*

This presentation examines the characteristics and behavior of theater audiences. We will examine a case study focusing on audiences at a performance held in Hiroshima City, Chugoku Region and at local centers in Japan. Theater groups and actors usually work in metropolises because the products they create are only consumed in limited spaces such as theaters. Tokyo is considered one of the active sites for exhibitioning these activities in Japan. Thus, audiences living outside the Greater Tokyo region face a lack of opportunities in viewing dramas and accessing information about such cultural products. On the other hand, some young and mid-career actors have been reallocating their activities from Tokyo to regional areas over the last few years. The development of information communication technologies in recent years contributes to reduction of opportunity differentials for consuming cultural products between audiences living within and beyond the Greater Tokyo region. Nevertheless, the results of our survey state that performances held in local cities are restricted by time and place and supported by "relative" audiences such as families and friends of actors and staffs and actors belonging to other groups. The authorized agent such as the public theaters has to play the role of a mediator between actors and audiences in local regions to provide for the lack of opportunities faced while viewing dramas.



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## Software Piracy as a Nation-State Cultural Trait

*Alexander FETISOV (Russian Federation)*

Quite a number of social indicators are multifaceted and unexpectedly can be employed for measurement and quantification of phenomena other than they have been designed for initially. It is these situations that open lucky opportunity to use ready- made data banks for cultural geography analyses. Thus "TeleGeography" analyzes and quantifies the state of the international long-distance telecommunication. Beside technical and planning purposes the statistical data may be used to evaluate business and family communication activity, diasporas presence and scale, and even the level of economic development by the directions and balance of in and outgoing calls. The BSA (Global Software Alliance) in its annual Report estimates the volume and value of unlicensed software installed on personal computers in 1993-2013 across more than 110 national and regional economies based on a global survey of more than 24,000 respondents. In 2013 the commercial value of unlicensed PC software installations totaled $62.7 billion dollars. The global rate at which PC software was installed without proper licensing was 43 percent in 2013. We analyzed the data and the key findings are: 1. The software piracy is a very persistent phenomenon varying in size and intensity from country to country, yet maintaining its share almost unchanged in the period of surveillance between 1982 and 2013. 2. The rate of piracy strongly correlates with the level of welfare. 3. The cultural divide runs between rich protestant countries and the rest of the world although we found a lot of peculiarities there.



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**Frontierity of Information Network: Indexes and Models of Network's Infiltration into New Territories (On Example of the Siberian Mail)**

*Victor BLANUTSA (Russian Federation)*

Functioning of information networks is one of factors of modern information society's development. However geographers analyze generally statistics of development of information networks and don't investigate a configuration, morphology, topology and trace of networks. It led to that now there are no the original geographical methods allowing to estimate change of a configuration in the extending information networks. The method of an assessment of network's infiltration on new territories is offered. This method relies on theoretical idea of a network's frontierity as such condition of a network at which part of network nodes were earlier and/or now are the last points of network's advance on new territories. We will enter two indexes of network's frontierity – GIF and OIF. The first index is offered to be determined by a formula: GIF = Ng : N, where Ng – number of nodes of a network which ever were frontier nodes (settlements), N – number of all nodes of a network; 0 <GIF <1. Then the second index is calculated on a formula: OIF = No : N, where No – number of nodes of a network which at the time of an assessment were frontier settlements; 0 < OIF <1, No ≤ Ng. All calculations were carried out on the example of infiltration of the Russian Empire postal network on the territory from the Ural Mountains to the Pacific Ocean in 1782 – 1916. All changes of Siberian regional postal networks were fixed on calendar months, that is there were 1620 points on time axis. Three general models (unidirectional external, multidirectional external and internal expansion of a network) and 38 special models (as alternation of external and internal expansion of a network) are revealed. To each of these models there corresponded a certain combination of GIF and OIF values. Change of a frontierity of Siberian regional postal networks is analyzed, the dominating regional models are defined, and similarity degree between the revealed models and real process of postal network expansion is established.



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## Telecommunication traffic diffusion in space

*Anastasia NAGIRNAYA (Russian Federation)*

New information and communication technologies (ICTs) enable information – a key resource of the modern world – to overcome easily any physical barriers and state boundaries. ICTs form the global information space, where from almost every place on the Earth it is possible to communicate with almost any other place. Understanding the spatial structure of telecommunication flows and their relationships to the socio-economic spatial structure becomes more and more critical in the modern information age (Guldmann, 2004). With this aim a multiscale comparative study of global and regional telecommunication traffic flows has been undertaken based on the official statistics on different types of ICT traffic (postal service, fixed telephone, mobile phone and the Internet) over the last two decades. Indicators developed, and spatial disparities in a level of telecommunicativeness and communicative openness of countries and regions (by the example of regions of Russia) revealed. A number of regional types obtained. The study of different ICTs' traffic structure has shown that the obvious trend of the last decades is a rise in the share of international traffic in communicative interactions conducted by the newest telecommunications, and a decline in the share of international traffic in traditional ICT traffic flows. Thus, when moving from traditional to the newest ICTs, a spatial scale of communication grows from mostly local to international, and international traffic is constantly migrating from traditional to the newest telecommunications. This study expands the understanding of international and interregional integration and globalisation processes in their communication aspects. The proposed indicators in the sphere of telecommunicativeness and international communicative openness help to assess the level of a country/region's integratedness in the global/national economy and the world/national socio-economic space in terms of information interactions.



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**Diffusion of information and communications technology products and "five Russias"**

*Stepan ZEMTSOV, Vyacheslav BABURIN (Russian Federation)*

The potential of new ICT-products absorption in Russia, primarily on an example of mobile communication, is explored in the article. The purpose was to classify regions by rate of diffusion, using several models, including Bass model. Active subscriptions per 100 people were used as a proper indicator. Five clusters were identified, corresponding to stages of diffusion by E. Rogers: innovators, early adopters, early majority, late majority and laggards. There are four stages of mobile communication diffusion, according to the spatial diffusion theory of T. Hagerstrand, which are determined by several factors. The most influential factors are income, price of services and competition. To assess the innovativeness of regional communities, or their ability to absorb new products, cluster analysis, based on the threshold values of Bass model parameters, was performed. The results were similar to those obtained earlier. Both previous methods of classification can be biased regarding special features of mobile communication diffusion. That is why, in the last stage an integral index of innovativeness was introduced, including rate of diffusion for several ICT-products. The analysis proved that hierarchical model of diffusion from the main centres to secondary prevails in Russia. Factor of geographical location also play a crucial role. At the initial stage, many regions have a similar level of saturation, but further absorption stops in the northern regions due to the low population density, and in the southern regions because of agricultural specialization and high institutional barriers. The research showed the significant difference in the rate of diffusion between Russian regions. Five stable clusters were identified.



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## Innovation process stages in space

*Tatiana ACHKASOVA (Russian Federation)*

Verbal and ideographically approaches in the study of spatial features of the innovation process is not effective enough. More productive is the use of nomothetical approach. Developed polystructural innovation process model divides it into four successive stages (information – knowledge – innovation – consumption innovations) and reveals three substantive logic level of this process (functions, objectives, functions, spatialization of functions). Spatial analysis of the innovation process using the proposed model is performed on different hierarchical levels. The country level is necessary for economic comparisons, and at the local level are studied separate innovative objects and their territorial combinations. The most common form of spatial organization of innovative objects are "parks" of various types. By type of specialization they are divided into scientific, industrial and technological parks and business parks. Various spatial combination of individual innovative objects and parks form territorial innovation systems with different morphological structures. Morphological structure is the essential characteristic of territorial innovation systems. In the work revealed the following morphological types of such systems: dispersion, nodular, linear, set-node with more complex configurations. The dispersed form of organization of innovative objects and systems resist nodular and linear forms, which the elements make full use of the benefits of geographical proximity. Nodes and linear forms, as well as individual objects can be formed more complex and advanced set-nodal structure.



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**Border Effects Arising at Expansion of Information Network (On Example of Russian Postal Network's Infiltration into China, 1870 – 1920)**

*Victor BLANUTSA (Russian Federation)*

The extending information network generates specific situations which are called border effects. Such effects are characteristic for different geographical systems, but in information networks these effects yet weren't studied by geographers. On the example of approach of the Russian postal network to the Russian-Chinese border and overcomings of this border two types of border effects (type A or "penetration", type B or "contact") and six kinds are identified. These kinds are penetration with creation of one node (A1), penetration with creation of a network (A2), penetration with cycling of an initial Russian postal network (A3), contact single (B1), contact with the unidirectional advance of a postal network along border (B2) and contact with bidirectional (in both parties from a contact place) advance of a network along border (B3). It is also possible to allocate special third type – "slipping" of a postal network along border without formation of nodes (type C). In our research from six kinds of border effects and a set of their chronological combinations the following situations were found: A1, A3, B1, B1→B2, B1→B2→B3, B1→A3, B1→A2→A3 and B1→A2→A3→B3. The type C was shown in two cases when postal lines passed along the Amur and Ussuri Rivers without initial formation of postal nodes. The detailed characteristic of all found border effects is provided. The set of theoretically possible border effects which weren't identified in our research, but can exist at expansion of other types of information networks is established. In nine places the Russian post network overcame border and in 1870-1915 in China some Russian post offices were open. Opening of the Russian post offices in China can be presented in the form of six innovative waves which occurred in the capital direction (Urga, Kalgan, Peking, Tien-Tsin; 1870), East Turkestan (Kuldja, Chuguchak, Kashgar; 1881 – 1899), China Proper (Shanghai, Chefoo, Hankow; 1896 – 1899), Kvantun Region (Port Arthur, Dalny; 1899 – 1902), Manchuria (Kharbin, Manchuli, Pogranichnaya, Mukden; 1899 – 1903) and External Mongolia (Ulyasutai, Kobdo, Tsain-Shabi, Khathyl, Sharasume; 1913 – 1915).



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# C12.15 Geography of Tourism, Leisure, and Global Change

## Tourism and regional development 1: South African Experiences

**Chairperson(s):** *Dieter K.MULLER*

- Domestic Youth Tourism In South Africa: The Matric Vac Festival
  *Jayne ROGERSON, Devin HARMER (South Africa)*
- The Executive Serviced Apartment Sector In South Africa: Evidence From Johannesburg And Cape Town
  *Desire Ann GREENBERG (South Africa)*
- The Growth And Evolution Of Beer Tourism In South Africa
  *Keagan James Edward COLLINS, Christian M. ROGERSON (South Africa)*
- Tourism And Regional Development In South Africa: The Role Of Domestic Tourism
  *Christian Myles ROGERSON (South Africa)*

## Tourism and regional development 2: Cultural dimensions

**Chairperson(s):** *Anne-Marie D'HAUSTERRE*

- Areas of dark tourism in Mexico: favorable conditions for its contemporary practice
  Álvaro LÓPEZ-LÓPEZ, Gino Jafet Quintero VENEGAS (Mexico)
- A Visit to the Izumo Grand Shrine: Japanese Women Travellers Seeking Love and Romance
  *Michiyo YOSHIDA (Japan)*
- Feeling Like at Home? –Tourists' Dress Behavior in a Muslim Country and Community Reactions
  *Manuela GUTBERLET (Oman)*
- Međugorje – the centre of religious tourism and urban chaos
  *Zeljka SILJKOVIC, Snjezana MUSA, Ranko MIRIC (Croatia)*

## Tourism and regional development 3: Rural issues

**Chairperson(s):** *Dieter K.MULLER*

- Displacement and Second Homes: Full Circle or Time to Move on?
  *Roger MARJAVAARA, Gijsbert HOOGENDOORN (Sweden)*
- Transformation of the "Golden Ring of Russia" tourist route: factors, new forms and types of tourism
  *Ekaterina V. AIGINA (Russian Federation)*



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- The contribution of rural tourism to the local development in Italy

  *Gian Luigi CORINTO, Francesco MUSOTTI, Anna Maria PIOLETTI (Italy)*

**Tourism and regional development 4: Host and guests**

**Chairperson(s):** *Anne-Marie D'HAUSTERRE*

- Changes Of Indigenous Livelihood And Place Bonding: A Case Study Of Wulai Community In Metropolitan Taipei, Taiwan

  *Yin-Jen CHEN, Su-Hsin LEE and Jui-Hsiang LU (Taiwan (China))*

- Casino gambling as a factor of regional development in the Slovene Istria

  *Gregor BALAŽIČ, Igor JURINČIČ (Slovenia)*

- The Gap of Awareness between Visitors and Hosts at Kurokawa Onsen Hot Spring Resort, Minami-Oguni, Kumamoto, Japan

  *Kazuo NOZU (Japan)*

- Tourism, Enclavic Spaces and Development

  *Jarkko SAARINEN (Finland)*

**Tourism and regional development 5: Planning and impacts**

**Chairperson(s):** *Dieter K.MULLER*

- Tourism and recreation space as an object of regional policy

  *Natalya ZIGERN-KORN (Russian Federation)*

- Kano Tourism Industry: Untapped Revenue And Employment Generation Potentials

  *Ado Mukhtar BICHI, Muhammad MURTALA (Nigeria)*

- Regional aspects of investment policy in the tourism and recreational complex in Southern Russia

  *Anatoly FILOBOK, V. MINENKOVA, D. SIDOROVA, M. BELIKOV (Russian Federation)*

**Tourism and regional development 6: Business perspectives**

**Chairperson(s):** *Anne-Marie D'HAUSTERRE*

- Country brand promotion on international tourism markets

  *Tatiana VALKOVA, Yuilia GERASIMOVA (Russian Federation)*

- Geographical diversification of Chinese tourism enterprises and its driving factors

  *Caiping WANG, Honggang XU, Xia LI (China (Beijing))*



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- Geoecological Marketing Of Tourist – Recreational Territories
  *Maria KONONOVA (Russian Federation)*

**Tourism and crisis**

**Chairperson(s):** *Sanette FERREIRA*

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  *Annaclaudia MARTINI, Dorina Maria BUDA (The Netherlands)*
- Crisis in Russia and its Impact on Tourism: Case of Latvia
  *Aija VAN DER STEINA, Maija ROZITE (Latvia)*
- Tourist perception as critical element of tourism crises
  *Marion KARL (Germany)*

**Tourism, mobility and information**

**Chairperson(s):** *Jie ZHANG*

- Remember the Alamo: Placing the Cinematic Experience
  *Leo EDWARD (United States of America)*
- Geographical analysis with big data on mobility and congestion of Urban tourist flow in China
  *Jie ZHANG, Y SUN, Zl ZHANG, L LL, Ll QIAN (China (Beijing))*
- Mobility patterns of land transit tourism in Central America
  *Gino QUINTERO-VENEGAS, Álvaro LÓPEZ LÓPEZ (Mexico)*
- The Effects of Distance on the Ecotourist Experience
  *Laurent BOURDEAU, Pascale MARCOTTE (Canada)*
- Tour operation and travel agency services – capital concentration and centralization and production of space. An analysis on Brazilian case.
  *Rita CRUZ (Brazil)*

**Tourism and environment 1: Protected areas**

**Chairperson(s):** *Sanette FERREIRA*

- An assessment of the performance of tourism at Mapungubwe National Park, South Africa
  *Innocent SINTHUMULE (South Africa)*



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- The fundamental necessary condition of the conservation the World Ocean as a global tourist-recreational system

  *Mikhail LOMONOSOV (Russian Federation)*

- Sustainability and nature-based mass tourism in China: Lessons from Huangshan

  *Xu HONGGANG, ZHUDAN, Bao JIGANG (China (Beijing))*

**Tourism and environment 2: Sustainability**

**Chairperson(s):** *Dieter K.MULLER*

- Renewable energy sources use for energy supply of tourist and recreational clusters

  *Nina TETERINA, Ludmila NEFEDOVA, Sofia KISELEVA (Russian Federation)*

- Geographical Justification of the Conception of the Sustainable Development of Recreational Nature Management in the Region

  *I.M. YAKOVENKO (Russian Federation)*

- Social evaluation of San Pedro Atlapulco's sustainability

  *Lilia ZIZUMBO-VILLARREAL, Neptalí MONTERROSO-SALVATIERRA; Alejandro PALAFOX-MUÑOZ; Graciela CRUZ-JIMÉNEZ; Ana Luz QUINTANILLA-MONTOYA (Mexico)*

**Tourism and environment 3: Challenges**

**Chairperson(s):** *Sanette FERREIRA*

- Residents' Perception Of Scenic Development Enterprises' Corporate Social Responsibility ： Perspective Of Place Attachment

  *Zeng LIPIN, Lin HONGXIA (China)*

- Tourism in areas prone to natural risks: danger and attraction

  *Elena PETROVA, Yury MIRONOV (Russian Federation)*

- Tourism, Landscape, and the Natural Environment

  *Vivek MAHAJAN, Rajender SINGH (India)*

- Virtual ecological paths as a new tool of eco-tourism

  *Maria TSEKINA, Vadim KORBUT (Russian Federation)*

**Tourism geographies**

**Chairperson(s):** *Dieter MULLER*

- "China Watching": The making of a collection in Journal of China Tourism Research

  *Honggen XIAO (*China*)*



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- Compiling the Dictionary of Tourism (Nature-Culture-Travels) in five languages

  *Anna KOMAROVA, V.M. KOTLYAKOV (Russian Federation)*

- Science Of Tourism As Integrative And Imperative Branch Of Geography

  *Iu. N. GOLUBCHIKOV, V.I. KRUZALIN (Russian Federation)*

**Geographies of polar tourism**

**Chairperson(s):** *Dieter K.MULLER*

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  *Dieter K. MÜLLER, Louise ROBERTSSON (Sweden)*

- Landscape - ecological support of the paleontologically oriented National park in the New Siberian (Novosibirskiy) archipelago

  *Grigoriy V. KAZACHKOV, S.V. LEVYKIN, A.A.CHIBILEV, G.V. KAZACHKOV, I.G. YAKOVLEV, D.A. GRUDININ (Russian Federation)*

- Local Tourism and Recreation as a Key Factor of Human Well-Being in the Circumpolar Territories of Krasnoyarsk Region, Russia

  *Elena GUK (Russian Federation)*

- Tourism development governance in the Russian Arctic: examples from Nenets AO and Sakha Republic

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  *Velvet NELSON (USA)*

- The Label of the UNESCO World Heritage List : Commercial Developments and Symbolic Appropriation of Territories

  *Laurent BOURDEAU, Etienne BERTHOLD (Canada)*

- The Victoria & Alfred Waterfront as playground for Capetonians

  *Sanette FERREIRA, Rozitta De VILLIERS (South Africa)*

- Developing a major tourism cluster in Val d'Europe?

  Anne-Marie D'HAUTESERRE (New Zealand)



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# POSTER EXHIBITION

- A Comparison of the Characteristics of Japanese and Foreign Travel Guidebooks
  *Shun-ichi YOKOYAMA, Naoko HASEGAWA (Japan)*
- Dark Tourism and Hansen's Disease Sanatoriums
  *Akira IDE, Tomohisa TAMURA (Japan)*
- Evaluation of recreational resources and recreational potential in the development of tourism
  *Tatiana VOLKOVA (Russian Federation)*
- Formation d'une nouvelle stratégie de développement des territoires du Nord
  *Elena TOTONOVA (Russian Federation)*
- Geographical analysis on taking photographs in the guided tour: a case study of experimental group tour in Izu Oshima Island, Japan
  *Takuya KOIKE, Koun SUGIMOTO, Toshio KIKUCHI (Japan)*
- Landscape Structure Of Territory The Cheboksary Agglomeration For Recreational Use
  *Anna GUMENYUK, Inna NIKONOROVA (Russian Federation)*
- Possibilities and Limitations of the Exchanges between Urban Areas and Rural Areas in Japan
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- Reuse of cultural resources and walking tourism in France —A case study of the "Stevenson trail"
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- Territorial organization and development of the museum tourism in Krasnodar region
  *Vera MINENKOVA, Anatoly FILOBOK, S. KIRILICHEVA, M. BELIKOV (Russian Federation)*
- Territorial organization of collective and individual accommodation facilities in Israel
  *Anatoly FILOBOK, Yuri KHOROSHKIN (Russian Federation)*
- The environmental and economic impacts of moorage marinas on the West Coast of the United States
  *Nathaniel TRUMBULL, Christine BAE, Jon IHNJI (United States of America)*
- The impact of recreation on vegetation and soil in protected areas in Sevastopol
  *Ekaterina KASHIRINA (Russian Federation)*



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- The structure of conflict among stakeholders in residential-touristic urban areas

  *Kyung Eun LEE (Republic of Korea)*

- The transformation and development of a sustainable tourism system in the guest house region in Iwai Beach, Minami-Boso City, Chiba Prefecture, Tokyo Metropolitan Suburb

  *Kei OTA (Japan)*

- Destination approach in Barguzinsky Nature Biosphere Preserve

  *Natalia LUZHKOVA, Anastasia MYADZELETS (Russian Federation)*

- Tourism And Natural Heritage Landscape Of A Ribeira Sacra (Galicia-Spain)

  Ángel CARBALLADA (Spain)

- Forecasts and tourism activity cycles

  *Anna ALEKSANDROVA (Russian Federation)*

- Scientific and methodological foundations for investment projects expertise in tourism and recreation

  *Nataliya SHABALINA (Russian Federation)*

- Les problèmes de la planification et d'organisation de tourisme médical et de la santé en Russie

  *M.MOTOVILOVA (Russian Federation)*

- Investigation of anthropogenic load on ecosystems: hiking tourism development as the case study

  *Anastasia MYADZELETS, Natalia LUZHKOVA (Russian Federation)*

- System of tourism and recreation clusters as a basis for tourism development in Russia

  *Victor KRUZHALIN, Kirill KRUZHALIN (Russian Federation)*

- Features of knowledge of the native land on the basis of implementation of excursion and tourist educational and informative projects

  *Natalia KUZNETSOVA, Victor KRUZHALIN (Russian Federation)*

- Tourist Maps And Modern Gadgets As An Info Factor Of Mobility In Tourism

  *Marina MOTOVILOVA, Valeriy BAYURA (Russian Federation)*

- Geo-Ecological Assessment On Tourism And Recreational Capacity In Mongolia

  *Tsogbadral KURELBAATAR, Amgalan AVKINSUKH, Khadbaatar SANDAG, Bat-Erdene TSEDEV, Ser-Od TSEDEVDORJ (Mongolia)*



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## Domestic Youth Tourism In South Africa: The Matric Vac Festival

*Jayne ROGERSON, Devin HARMER (South Africa)*

The origins, organization and emerging geographies of the South African youth travel phenomenon known as the matric-Vac or Rage Festival will be explored. The study will be positioned within the broader context of international youth travel as well as other post-school 'rite of passage' events such as Schoolies Week in the Gold Coast of Australia and Spring Break in the United States. In addition to being a celebration for school leavers the post-school vacation is also emerging as a major tourism generator with substantial direct and indirect economic benefits for the local communities and organizations that host these events. Since its establishment in 2000 the Matric-Vac phenomenon in South Africa has expanded rapidly. The origins and growth of this youth travel phenomenon will be traced. In addition, current student expectations of their forthcoming Vac festival and the experiences of recent Vac festival goers will be outlined. The attraction of thousands of school leavers, along with a plethora of websites and promoters offering a variety of packages results in matric-Vac becoming a commercialized phenomenon with associated positive and negative impacts for the residents and businesses of the destinations. The South African research assesses the various local social and economic impacts of this youth tourism phenomenon and is illustrated by two venues, namely, Umhlanga Rocks in KwaZulu Natal and Plettenberg Bay in the Western Cape.



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## The Executive Serviced Apartment Sector In South Africa: Evidence From Johannesburg And Cape Town

*Desire Ann GREENBERG (South Africa)*

The growth of the executive serviced apartment sector represents a significant addition to the conventional form of short-term accommodation in South Africa. Although there has been much research done internationally on this particular niche sector, specifically on executive serviced apartments, there has been little, if any focus on the industry locally. The allure of this form of accommodation can be attributed to a number of factors, these include: lower monthly rental costs when compared to extended hotel stays; the comfort and privacy of a homelike environment; the central locations; together with a number of services and facilities often associated with that of an upmarket hotel. In two of South Africa's largest economic centres, namely Johannesburg and Cape Town, the serviced apartment industry has been predominantly fuelled by the business tourism sector. This is due to the growing numbers of local and international business tourists. Many countries rely on the income generated from the business tourism sector, and others beginning to understand the potential revenue of this phenomena. This paper aims to identify, define and distinguish corporate serviced apartments within the hospitality sector, and describe and classify their unique features and selling points, and what sets them apart from other forms of accommodation. Using the examples of Cape Town and Johannesburg, it is argued that the South African business tourism industry is an important contributor to local economic development and although the industry has shown significant growth in the past decade, has potential to continue growing and contributing sustainably to the economy.



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## The Growth And Evolution Of Beer Tourism In South Africa

*Keagan James Edward COLLINS, Christian M. ROGERSON (South Africa)*

Beer tourism is a growing dimension of culinary or food tourism. Although South Africa is traditionally associated with wine tourism the country is enjoying the development of beer tourism, in particular with the appearance of craft beer micro-breweries. Against the background of factors influencing the wider international growth of beer tourism, an analysis is presented of the growth and evolution of beer tourism in South Africa. It is argued South Africa is an emerging destination for beer tourism. Over the past two decades several initiatives have been launched to strengthen beer tourism. Since the early 2000s the momentum of beer tourism in South Africa has accelerated with the establishment of over one hundred micro-breweries producing a wide array of craft beers. Neo-localism is an important concept for interpreting the growth of the craft beer industry. Local consumers dissatisfied with mass-produced generic lagers reacted positively to the array of new offerings made by the country's craft micro-brewers, including with visits to breweries. The expansion of craft beer production has been associated with the launch of several beer festivals and beer trails which are expanding further the footprint of beer tourism in South Africa. The growth of craft beer micro-breweries is the driving force for beer tourism and offers potential for new tourism-led local development opportunities.



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## Tourism And Regional Development In South Africa: The Role Of Domestic Tourism

*Christian Myles ROGERSON (South Africa)*

Tourism is increasingly under scrutiny as a tool for catalysing economic growth, welfare improvements and employment opportunities in peripheral regions. However, Hall (2007) points out the "reality is that tourism's role in regional development remains relatively poorly understood as it is often given only a cursory examination by those in regional planning and public policy analysis". Within growing international debates around tourism and regional development this paper examines the South African case. The space economy of South Africa has a distorted core-periphery structure with uneven patterns of geographical development. New policy initiatives have been launched by national government for tourism to be a key vehicle for regional development. Priority areas for tourism-led regional development in South Africa are the country's 'distressed areas', which are the most marginalised in terms of economic and social development and exhibit high levels of unemployment and poverty. At the core of these 'distressed areas' are the mainly rural district municipalities that encompass the former rural Homelands created by apartheid planning. This paper examines the structure and shifting geographies of domestic tourism in South Africa from 2000 to the present-day. It highlights the importance of domestic tourism within the tourism economies of most the country's distressed areas. Critical issues for policy development in respect of different forms of domestic tourism occurring in the distressed areas are analysed.



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**Areas of dark tourism in Mexico: favorable conditions for its contemporary practice**

Álvaro LÓPEZ-LÓPEZ, Gino Jafet Quintero VENEGAS (Mexico)

"Dark tourism" was proposed in the late nineties by Foley and Lennon as a phenomenon which consists of both exposure and consumption of sites associated with death, disaster and risk (real or created for consumption). While dark tourism practices have already been performed, it is until recent years that this activity has gained interest for the Social and Cultural Studies in the formal sense, thus, Geography has recently being interested in determining its conceptual scope and how it is expressed within the space. The actual Mexican socioeconomic situation has been characterized by the expansion of social contrasts resulting in new scenarios for dark tourism. Therefore, the purpose of this paper is to show the spatial circumstances of some of the places sold or consumed as part of dark tourism in Mexico, especially those related to slum, drug dealing and informal trade.



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## A Visit to the Izumo Grand Shrine: Japanese Women Travellers Seeking Love and Romance

*Michiyo YOSHIDA (Japan)*

Among tourism geography researchers is a growing interest in women travellers seeking love and romance. Many of these researchers focus on the practices of Western women travelling to meet men at, or on the way to, their destinations, and pay little attention to the practices of Asian women travellers seeking love and romance. This study tried to contribute to filling this gap by exploring the practice among Japanese women of travelling to shrines to pray to gods for chances to meet men, and its influence on places. For this purpose, women's magazines and travel guidebooks were examined, and the Izumo Grand Shrine—the one of the most popular destinations for women travellers seeking love and romance in Japan—was observed. The results suggest that the travel of Japanese women to shrines for love and romance became popular during a spiritual boom in the 1990s. The Izumo Grand Shrine began to sell various types of paper fortunes and charms to women travellers. Additionally, cafes, restaurants, souvenir shops, and hotels near the shrine developed foods, goods, and services that were advertised as supplementary to the love and romance quest. These women travellers' dining and shopping activities contributed to creating highly commercialised leisure spaces centred on the Izumo Grand Shrine. Thus, it can be concluded that Japanese women travellers' quest for love and romance does not necessarily involve visiting places such as beaches and resorts to meet men, and leads to forming places to enjoy oneself without the company of men, by visiting a shrine, and eating and shopping near it.



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## Feeling Like at Home? –Tourists' Dress Behavior in a Muslim Country and Community Reactions

*Manuela GUTBERLET (Oman)*

Tourism has an impact on the local population and its culture. A different value system and communication style contribute to different social contact situations, such as culture shock. The following paper examines cross-cultural communication in a Muslim country and the notion of tourists behaving "like at home" while being away, in a collectivist sociocultural context. It explores the dress behavior of German-speaking cruise tourists from a super-sized cruise liner visiting Oman. On board the cruise liner there is no dress code. However, while visiting the port of call there are guidelines, e.g. short and revealing dresses are seen as beachwear and inappropriate for public areas. How has the dress code been communicated? How do the tourists react/dress? How does the local community react? A large scale questionnaire survey was conducted in 2012/13 among 1130 German-speaking cruise tourists in Muscat along with in-depth interviews with tourists and stakeholders of the community, including shop vendors, residents and cultural brokers such as representatives of the Ministry of Tourism, tour guides and local tour operators. Pre-travel information was studied. Moreover, interviews with high-level officials were conducted including the Assistant Grand Mufti. Travel ethnography was conducted at two attractions. Results suggest that 98 % of the tourists were informed in advance about the dress code. However, often the communication was not clear enough. On land, local male tour guides and tourism managers do not speak explicitly about the dress code, which is treated as a sensitive and private topic. They argue that the tourists should inform themselves. As a result, female tourists especially and cruise staff dress in a hedonistic attitude of self-interest and "mindlessness". As a consequence since the arrival of large cruise liners the local, predominantly male business community have experienced "culture shock" situations.



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## Međugorje – the centre of religious tourism and urban chaos

*Zeljka SILJKOVIC, Snjezana MUSA, Ranko MIRIC (Croatia)*

Međugorje – the centre of religious tourism and urban chaos Međugorje is the biggest pilgrimage centre in the Southeastern Europe. Since 1981, when (according to the testimony of five children – "visionaries") the Blessed Virgin Mary appeared, until 2014 this small Herzegovinian village has been visited by over 28 million of pilgrims. More than 80% of pilgrims are foreigners (Italians, Czech, Germans, Koreans, Lebanon, Polish, Irish, and others). According to the number of visitors, Međugorje is the third Virgin Mary sanctuary in Europe. Virgin Mary apparitions, as a specific event, had multiple consequences: the development of pilgrim tourism, transformation of rural landscape into urban one, transformation of the landscape, the development of tertiary sector; which all unavoidably triggered the socio-economic change of population structure, the increase in the population number but also numerous difficulties. Uncontrolled growth and the construction of residential objects were not followed by adequate infrastructure. In Međugorje, inconsistency and understatement of legal state, led to chaos in economy, total transformation of agricultural land, changes concerning management, corruption, illegal employment, lack of statistical data analysis and recording of the number of visitors, and others. Special problem is undeveloped infrastructure: inadequate sewer and water supply system, overload of the electrical network, unresolved question of waste disposal, low quality of state and local roads. Another problem is the visual degradation of space caused by chaotic unplanned construction, landscape changes, land use, disappearing of river beds, etc. Key words: Međugorje, religious tourism, landscape transformation, urban chaos, insufficient infrastructure.



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## Displacement and Second Homes: Full Circle or Time to Move on?

*Roger MARJAVAARA, Gijsbert HOOGENDOORN (Sweden)*

Displacement of local permanent residents as a result of second home ownership has been a key feature of second homes tourism research since the 1970s. However, the work of Nick Gallent in the late 1990s and early 2000s, in particular, questioned the social and economic value of second homes in the United Kingdom (UK). However, the displacement debate seems to have focused on the spatially specific concerns of the United Kingdom, and an argument can be made that except for anecdotal evidence and opinions voiced in the popular media, little empirical evidence has been provided to prove that second homes are directly responsible for displacement of local communities (see Hoogendoorn and Visser, 2015). In the late 2000s, a challenge against the 'displacement theory' came from Marjavaara (2007a; 2007b; 2007c; 2009) within the context of Sweden where little evidence of displacement was found. The debate concerning displacement has also been important in the developing world, especially in South Africa, where Hoogendoorn and Visser (2015) have argued against the displacement debates emerging from the UK. Despite the contentious nature of the debate, we would argue that no researchers would want anybody to be subjected to forced migration. However, the hard empirical evidence needs to be provided to prove that people are directly displaced because of second homes first. Otherwise, the value of debating displacement as a result of second home ownership is questionable. Nevertheless, Paris (2009) argues that second homes and displacement should be seen as an empirical question or hypothesis that needs to be proved or disproved. Therefore, this study aims at testing the displacement hypothesis in Sweden as a follow-up study on research done previously.



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## Transformation of the "Golden Ring of Russia " tourist route: factors, new forms and types of tourism

*Ekaterina V. AIGINA (Russian Federation)*

Quite few tourist brands in Russia are known not only at regional level but stand for the image of the whole country. The "Golden Ring of Russia" tourist route is among them. Destinations of the "Golden Ring of Russia" still keep up high tourism and recreational attractiveness. However, the tourist flow here is decreasing and consists of domestic tourists mainly. Due to various factors (geopolitical, infrastructural, social, economic, et al.) this route has undergone a significant transformation in last decades. The whole pattern of the route has changed. The circle route is now replaced by radial (with 2-3 places to visit) or even single-point routes. One can observe the loss of former multi-day route and its transition to 1-2-3-day tours, mainly on weekends. New tourism attractions and new amenities as well as new forms of tourism activities are introduced in this region. Transformed tourism destinations together with the changes in consumers' interests and demands have significantly diversified types of tourism in the Golden Ring towns. If formerly this route was almost exclusively aimed at cultural tourism, now there are ecotourism, leisure, family, business and other types of tourism emerging here. Event tourism is becoming one of the key areas of tourism development in many parts of the Golden Ring of Russia. In general, cultural events dominate; they are followed by sport events and national holidays. Analysis of the current "Golden Ring of Russia" tourism product shows that 1-2-day programs timed to a wide range of events have a steady demand. With the joint efforts of national and local tourism business and management event tourism can become one of the most effective ways for improving the Golden Ring situation.



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## The contribution of rural tourism to the local development in Italy

*Gian Luigi CORINTO, Francesco MUSOTTI, Anna Maria PIOLETTI (Italy)*

In recent years the rural and farm tourism showed a clear capacity to improve the supply of hospitality in all the regions of Italy. This is certainly due to the Common Agricultural Policy which, fostering even a Rural Development Policy since 1993, stated new 'social' and environmental' goals, namely 'multifunctionality', for agriculture and rural society. In the multifunctional agriculture even hospitality is a farming pertinency oriented to foster the socioeconomic development of local communities and rural areas. The paper reports the results of an empirical survey on the territorial diffusion of rural tourism in Italy and its relations with the rest of the economic activities within the theoretical perspective of 'local development'. Following the Italian School on 'Marshallian Industrial Districts', we have consider the 611 Local Labor Systems, defined by ISTAT (Italian Census Center), as the statistical unit and detected data relating to tourism, rural tourism, other industries, market labor and population in order to have e quantitative model of the phenomenon. Results show the different situations where farm and rural tourism are able to sustain the local economies and where the can assure a local social and economic resilience.



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## Changes Of Indigenous Livelihood And Place Bonding: A Case Study Of Wulai Community In Metropolitan Taipei, Taiwan

*Yin-Jen CHEN, Su-Hsin LEE and Jui-Hsiang LU (Taiwan (China))*

Indigenous areas have risen of an upsurge of tourism development over the past two decades; the national policy development, the stationed tourism industry, and the Indigenous cultures join forces to reproduce a new heterotopia of Indigenous livelihood and place bonding. Decades of tourism consumption activities increased alienation of the living space and man-land relationship in Wulai Indigenous community in Northern Taiwan. Chungchi Village, Hsinhsien Village, and Wulai Village of Wulai Indigenous community have been chosen to explore the differing front-stage and back-stage life behaviors of the Atayal people, as well as the authenticity and original meanings of Indigenous culture. Using the concepts of Cultural authenticity and Front and Back stages, in-depth interview is applied from the qualitative perspective to analyze the indigenous new region caused by the Tourism industry which is following the changing of Indigenous livelihood and place bonding in Wulai. The study revealed that the heterogeneity exists even within the same ethnic group that Wulai Village has a very obvious inclination toward the Han culture, which leads to a loss of folk culture and commodification of traditional crafts. Regarding the back-side hill of Indigenous villages, Chungchi Village and Hsinhsien Village have made committed efforts to pass their native language down to the younger generation via primary school education and non-formal networks. The front-stage Atayal people have developed a simplified and uniform dance style for tourists to enjoy, but engage in a freer, natural style of dancing when there are no visitors or tourists present. The research results have demonstrated a deeper understanding of the development of tourism among the Atayal people in the Wulai community, as seen from the aspect of front-stage and back-stage lives. Furthermore, through scrutiny of these different social behaviors, the authors have submitted responsive strategies for building a social space centered round the indigenous people.



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**Casino gambling as a factor of regional development in the Slovene Istria**

*Gregor BALAŽIČ, Igor JURINČIČ (Slovenia)*

Casino gambling in the Slovene Istria has had a long tradition, its origins dating back to the beginning of the 20th century, to the times of the Austro-Hungarian Empire. Ever since its rebirth during Yugoslav times in the 1960s, gambling tourism has contributed significantly to the development of the area. Until recently, gambling tourism has been one of the most important forms of tourism in addition to 3S and congress tourism. The purpose of this paper is to determine the contribution of gambling tourism to the regional development of the Slovene Istria. To this end, selected social, spatial and economic indicators were examined. The selected socio-geographic indicators related to gambling tourism were then compared with the average indicator rates of regional development at the national level. The results show that gambling tourism is an important factor of regional development in all socio-geographic categories studied. However, gambling tourism's future role in regional development remains an open question due to the impacts of the financial crisis and the consequent decline in the number of guests, as well as reduced levels of investment in the region. Keywords: casinos, gambling tourism, regional development, Slovene Istria



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## The Gap of Awareness between Visitors and Hosts at Kurokawa Onsen Hot Spring Resort, Minami-Oguni, Kumamoto, Japan

*Kazuo NOZU (Japan)*

Kurokawa Onsen Area is located in northern part of Kyushu Island, Western Japan. This area has 300 years history of hot spring source, still had not developed for long time due to poor accessibility by the location in mountain area. When the toll road 'Beppu-Aso Doro' has opened, accommodations in this area obtained temporary profit for several years, known as a part of neighbouring destination, 'Senomoto'. After the boom has peaked out, this area has not been recognised as tourism destination. In 1983, Kurokawa Onsen Tourist Inn Association was activated because members were replaced by younger owners of accommodation. Since this 'revolution', most of accommodations have created 'Roten-buro' outdoor baths, supplied with high temperature hot spring water. In addition, Tourist Inn Association has promoted 'Kurokawa Onsen' as a single destination more than each of accommodations. This promotion was formed by the private sector using profit of selling 'Nyuto-tegata', the ticket valid for three times bathing at outdoor baths. As a result, Kurokawa Onsen has acquired the status of famous tourist destination by the tourist magazine 'Jalan' on 1998. However, travel agencies have not engaged with Kurokawa Onsen for a long time. After the development of this area, tour operators tried to develop group tour courses including Kurokawa Onsen as one of the destinations in Kyushu Island. Nevertheless, most of accommodations are smaller sized and not suitable for group tour with large number of tour members. Therefore, the deference has been occurred between supply and demand, this causes complains by visitors. This research will analyse the situation of tourist destination for sustainable tourism with viewpoint of how to fill the gap between visitors and hosts.



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## Tourism, Enclavic Spaces and Development

*Jarkko SAARINEN (Finland)*

Enclave tourism refers to a form of development characterized by socio-spatial regulations of host-guest relations and related mobilities in tourism. Typically such developments contain all or a vast majority of facilities and services needed for tourists who have limited possibilities and/or desires to leave the enclave. Instead, they are encouraged to stay and consume inside the self-contained resort environment. At the same time, the locals' access to the enclavic space is often regulated. Tourism enclaves are rather common features in development and management situations dominated by external forces, actors, and power inequalities, especially in the peripheries and/or developing countries. They are managed and owned by multinational businesses. Typically international all-inclusive resorts and so-called package tours, where the offered products and services are included in one prepaid price, are characterized by the elements of enclave tourism. For example, the tourist-generating economies organize the package tours, including transportation, accommodation, and excursions, in a way that they have a capacity to control tourist expenditures through the limit of their mobility, to the relative exclusion of the petty producers and other local service providers. Therefore, enclavic all-inclusive resorts can turn out to be all-exclusive for local communities in development. This paper aims to discuss the idea of tourism enclave and its relation to local and regional development both conceptually and by utilizing a case study.



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## Tourism and recreation space as an object of regional policy

*Natalya ZIGERN-KORN (Russian Federation)*

According to the concept of territorial capital the definition of development strategies for each region is determined by the local assets and potential and its wise exploitation. The reasons about tourism mission for different types of territory exploitation and level of social and economic development, the idea of methods of tourist development of regions space are the core lines for state regulation of territorial development in general, and for regional policy in the sphere of tourism. Selection of model regions due to their development types forms information basis for tourism function in regional development assessment. Results of the carried-out assessment allow rethinking the category of tourist and recreational potential of the territory from the standpoint of prospects and principles of a sustainable development. The report deals with "tourist and recreational space" category and its importance for the tourism development solutions. The role and mission of tourism in regional development is estimated on the example of the Murmansk region, the structural features of the tourist and recreational space, defining tourist and recreational potential of the territory are discussing. The next important feature that must be considered to fulfill imagination for tourist developing pattern in the region is the strategy of recreation space development. A few approaches of such strategies use to be common, but some specific for Murmansk region are under the view. Proposals for the Murmansk region tourist and recreational space optimization through the tools of regional policy in order to realize the potential of regional development are justified.



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## Kano Tourism Industry: Untapped Revenue And Employment Generation Potentials

*Ado Mukhtar BICHI, Muhammad MURTALA (Nigeria)*

Abstract This paper addresses Kano tourism industry as a high-impact revenue and employment generation sector which tend to reflect on the need to transform the economy to attract internally generated revenue and to create jobs through the provision of critical infrastructure. Tourism as an international industry and as the biggest provider of jobs on the planet boasts a greater array of heterogeneous stakeholders than many other industries. The energetic growth and development of the industry can be made possible through government concerted effort in providing the enablers. The result shows Kano as a potential tourist haven whose resources are poorly harness. The results have provided as a framework for spurring the development of tourism features, identifying hidden events, and as a wake-up-call to Kano state government. Using a wide variety of sources, mainly in the tourism literature, this paper recommends the need to provide essential infrastructural facilities to boost the tourism industry and transform the economy.



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## Regional aspects of investment policy in the tourism and recreational complex in Southern Russia

*Anatoly FILOBOK, V. MINENKOVA, D. SIDOROVA, M. BELIKOV (Russian Federation)*

There is a historical significant multifunctional recreation complex in southern Russia, which attracts the mass consumer. However, most travel and recreational agencies and enterprises have a constant shortage of financial resources for the implementation of their investment projects. Modernization and reconstruction of the tourism facilities require a fundamentally new concept of attracting financial resources. Strategic investment projects and the federal programs implemented in the regions of Southern Russia and guarantee increasing stability of the economy. Locomotives of this region are two subjects – Krasnodar and Rostov Regions. Almost all investment support tools developed in Krasnodar region. After the Olympic and Paralympic winter games took place in Sochi in 2014, Krasnodar region has committed to the implementation of several other investment megaprojects. Every project is a kind of nucleus, and the whole business – from large corporations to small businesses – will develop around it. Overall, the Southern Federal District steadily occupies one of the leading places of attraction for domestic and foreign investors, as well as the ranking of the regions of Russia in matters of legislative base of investment sphere. In recent years, new investors, including private investors, have come inyo the tourism sector. The aim of the investment policy in the tourist-recreational complex is to convert tourist opportunities of Russian territories into a liquid product, as Russia is among the top five due to the power of recreational opportunities of territories and the cultural component of the country. Nowadays local authorities have many opportunities to support and encourage investment in the regions. There are federal and regional programs related to the tourism industry. They allow you to attract budget funds to its development.



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## Country brand promotion on international tourism markets

*Tatiana VALKOVA, Yuilia GERASIMOVA (Russian Federation)*

Each country represents a unique tourist brand, however it is not easy to introduce the country's identity through its brand using present-day and beneficial tools, to say nothing of the fact that only a few countries do research on market trends, develop projects for the studied tourist market that all interested parties want the first time to enter or strengthen their positions on. Some countries due to its geographical position, consumer market interest, the diversity of itineraries provided, visa formalities, transport accessibility level, international politics, image among the population, are gaining strong positions in tourism, while some of the states still left behind the market trying to catch up and change the existing tourist traditions and trends. The essence of the success lies in the specifics of the studied market, taking into account the psychological aspect of the target consumer, the level of awareness of the host country and destination preferences of potential consumers. The destinations promotion market is highly competitive. A new or unpopular destination will be substantially different from the well-known ones on the market. The quantity and quality of a range of the promotion methods play a significant role in tourism, such as a participation in international projects (e.g. two countries cross-tourism, world travel fairs etc), the tourist national office, regional tourism portals, the success of which depends on the practical market and consumers analysis, price policy and current formalities. The most effective way to promote a country's brand is to promote a country as a part of the tourism product, which is presented on the world tourism market and is designed to attract tourists and increase the tourist flow.



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## Geographical diversification of Chinese tourism enterprises and its driving factors

*Caiping WANG, Honggang XU, Xia LI (China (Beijing))*

The regional tourism development has largely been dependent on investment in China. One of the key sources comes from the spatial diversification of Chinese tourism enterprises. Using the sample of Chinese tourism enterprises, including listed companies and regional tourism groups during the year from 2001 to 2013, this article investigates spatial distribution characteristics of these tourism firms' business, and attempts to find the driving factors behind these companies geographical expanding. Descriptive statistical analysis shows that about 70% tourism firms have expanded their business outside local area, and about 57% of the total has expanded the business more widely, even outside the country. However, there are differences among the tourism companies in different sectors. The attraction companies generally choose to limit their business in local. But the hotel companies, tend to diversify their business in more developed areas, or areas with good scenery. The research also found out that the government intervention plays key role in the spatial expansion of the tourism firms. The study concludes that a good institutional environment would facilitate the spatial expansion of the tourism firms and thus help to address the lack of investment and lack of integration into the broad tourism value chain system for the less development regions.



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## Geoecological Marketing Of Tourist – Recreational Territories

*Maria KONONOVA (Russian Federation)*

In the report the new kind of activity - geoecological marketing is submitted. The author gives the recommendation to achieve positive outcomes in conditions of sustainable development of territories, in particular using of the monitoring information of development territory, the Internet geoecomarketing of tourist-recreational territories, the geoecomarketing in conditions of the market. The basic conceptual principles of geoecomarketing are resulted. Division into ancient, antique, growing and young cities causes presence and/or absence of long history of formation of nature-technical inhabitancy in its anthropogenous and technogenic components. Thus, revitalization of territories as objects of real estate with new qualitative characteristics of frame service conditions for last century; reconstruction, modernizations, preservation of constructions as objects of real estate of various value for the population and mankind demand address and detailed geospheric inspection. Creation of modules of geoecological marketing for formation and arrangement of tourist-recreational territories of new generation of the globalized culture taking into account local color and natural conditions of landscape support of nature-climatic zoning of territories is aimed at improvement and maintenance of innovative possibilities of operation of tourist-recreational territories of various qualitative and area characteristics, the dynamic and static loading, the determined and stochastic processes of operation of infrastructures. 1. Absence geoecomarketing doesn't allow to provide stability of development of tourism. 2. The account of geoecomarketing is necessary at formation of price estimations of territories of building of objects of tourism and sports.



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## Tourism, Crisis and Emotions

*Annaclaudia MARTINI, Dorina Maria BUDA (The Netherlands)*

Crises are considered times of intense difficulty or danger and are often deeply emotional experiences. In some instances, the ways crises are portrayed in the media can spark people's curiosity and imagination and drive tourists to visit places subject to present or past dangers. In the last decades, tourism stakeholders looking for 'alternative' tourism forms have capitalized on the potential of places connected to crises, dangers and atrocities. In tourism studies these forms of tourism are known as 'dark tourism'. Tourism experiences at such places are often emotional and affectual. Tourists visiting a dark tourism attraction negotiate emotional and ethical concerns through interconnections between affects, emotions and cognition, that create a field of potentiality for the experience. Although affects and emotions are part of the tourist experience and are increasingly recognized by social scientists, the so-called affective turn is still marginal in tourism studies in general and dark tourism in particular (Buda et al 2014). The affective turn explores creative dynamics of affect and emotion in the reproduction of culture, subjectivity and power relations (Harding & Pribram, 2002). Emotion can be considered as 'subjective content' and 'qualified intensity', whereas affect is intensity itself (Clough & Halley, 2007; Gregg & Seigworth, 2010). Our aim in this presentation is to address this gap by bringing together geographies of dark tourism in places of crisis, and geographies of affect and emotions. Our focus lies on how places of crisis (such as Chernobyl and Fukushima for example) are spatially transformed into dark tourism attractions through emotional and affectual engagements. Keywords: affect; emotion; crisis; dark tourism. References: Buda, D. M., d'Hauteserre, A. M., Johnston, L. (2014). Feeling and Tourism Studies. Annals of Tourism Research, 46, pp.102-114. Clough, P. T. & Halley, J. (2007). (Eds.). The affective turn: Theorizing the social. London, England: Duke University Press. Gregg, M., & Seigworth, G. J. (Eds.). (2010). The affect theory reader. Durham, NC: Duke University Press. Harding, J., & Pribram, E. D. (2002). The power of feeling: Locating emotions in culture. European Journal of Cultural Studies, 5(4), 407-426.



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## Crisis in Russia and its Impact on Tourism: Case of Latvia

*Aija VAN DER STEINA, Maija ROZITE (Latvia)*

Russian tourists have been the biggest source market in Latvia since year 2010. With 21,7% share in inbound tourism in 2013 and 20 % average annual growth rate from 2009 - 2013, it was one of the main priority markets for tourism and hospitality industry in Latvia. Russian tourists not only constituted the majority of inbound tourism, but also provided a solution to seasonality as demand of Russian tourists led to the improvement of accommodations occupancy rates in December and January year after year. The impact of the crisis became visible since July 2014 with Russian tourists numbers decreasing by 6 % for 2014 (CSB, 2014) and even further fall is expected in 2015. This study analyses how Russian crisis has affected travel to Latvia and how NTO, DMOs and tourism enterprises reacted to decreasing tourist numbers and revenues. The research reveals the planned short term and long term activities. The study uses quantitative secondary data and qualitative primary data. Qualitative analysis provides insights into solutions to decreasing Russian tourism demand. Interviews carried out with tourism representatives indicate a tourism sector crisis as enterprises working with the Russian market are experiencing rapid fall in demand and revenues and it is difficult to forecast the period of instability of the Russian source market. According to Latvian Hotel and Restaurant Association`s data decrease in Russian guest numbers by 40 -50% in December 2014 and January 2015 led to serious fall in hotel occupancy rates. Some tour operators working with Russian market have experienced a fall up to 50%.



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## Tourist perception as critical element of tourism crises

*Marion KARL (Germany)*

Tourism is an open system which interacts with its physical and socio-cultural environment (home or guest country) in various ways. Safety and security events for example influence the tourism sector directly or indirectly. Not every safety and security event however must necessarily have a negative influence on tourism. Whether or not these events lead to a crisis in tourism in the affected destination depends on tourists' perceptions. A crisis for the tourism industry will only evolve if a critical mass of tourists perceives an event as constraint to visit a destination. Past studies show that not the actual safety and security situation in a destination but the tourists' perceptions influence the decision not to visit a destination which reflects on tourism flows. Even if a situation is safe and secure for the tourist, it could still lead to a decline if the tourist perceives the situation to be different. Therefore, the focus of the study is on the interaction between tourists' risk perceptions, personality traits and destination characteristics. How are safety and security events perceived by tourists depending on the type of event (e.g. natural or man-made), preferred travel destination or tourist characteristics? For this purpose, two quantitative surveys were conducted in Germany in 2013 (n = 835) and 2014 (n = 402) on tourists' risk perceptions and destination choices. Results indicate that the interplay between these factors determine destination choices for or against an "unsafe" destination which could consequently lead to a crisis due to a decline in tourist arrivals. Destination management and marketing should focus on the perception of a destination in crisis and try to specifically address and change tourists' perceptions.



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## Remember the Alamo: Placing the Cinematic Experience

*Leo EDWARD (United States of America)*

Remember the Alamo: Placing the Cinematic Experience The Alamo Drafthouse is a movie theater chain that originated in Austin, Texas in 1997. Each theater within the chain can create a unique experience for the filmgoer in physical and programmatic ways by providing special stadium seating with a sloping floor toward the screen, extra leg room, a table that fronts every viewer, a menu for food and alcohol that can be served during the film, and a variety of offerings that vary from mainstream full-length films, shorts, and cartoons, to programmatic events that range from the more conventional to the avant-garde to the provocative to the bizarre. This presentation considers the nature of 'the Alamo' as a site of exhibition in terms of the movie going experience and suggests an ANT-based framework as a valuable means of conceptualizing the many elements innate to the site and experience that engage one another and that comprise the assemblage as a comprehensive mediated geography. Scrutiny of the Alamo's more unique programs and settings reveal intentional constructions intended for select audiences that desire an experience not provided by standard home or public theater settings. The paper concludes that this desire to participate in a more community based cinematic experience reflects an ironic discursive mode as envisioned by Hutcheon (2004) in which the audience seeks a momentary identity that distinguishes itself for a brief moment of the theater visit.



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**Geographical analysis with big data on mobility and congestion of Urban tourist flow in China**

*Jie ZHANG, Y SUN, Zl ZHANG, L LL, Ll QIAN (China (Beijing))*

Urban tourist congestion problem has become critical issues in urban tourism and urban governance in China, especially with emerge of more and more big urban events and occasional crowd stampede accident. Big data analysis provided lot of information about the urban tourist and recreationalist flow in urban public space, and sophisticated report with big data seems provide detailed description of the urban tourist mobility and the reasonable causes of the stampede tragedy, yet unfortunately, the Shanghai Stampede Tragedy did happen. In this presentation, we evaluated the characteristics of the map of the hotspot and the temporal fluctuated curves and the related comparison of the tourist flow in the big data report on the tragedy, and then proposed and emphasized the geographic analysis of the site space structure on the congestion analysis. We classified the urban tourist flow into 5 types, and describe the behavioral character of the event participants. We also classified the urban public leisure spaces into 4 types and the related sub-types, and described the character and the geographical structure of each urban tourist-recreational space. In order to understand the geographic structure of urban peripheral space of urban tourist attractions or public gathering space, with case of Nanjing we studied the connectivity and accessibility with Space Syntax Technique by using indices of connectivity value, control value, mean depth value, global integration value, local integration value as well as kernel index, and revealed detail spatial structure problem of the area. As conclusion, big data analysis has got its advantage in tracing tourist flow and describing status of the congestion. Yet the data its self could not be used as forecasting directly. Geographical analysis provide more reasonable way to analyze the congestion, especially combining with big data. Monitoring and management like early warning are also critical issues.



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## Mobility patterns of land transit tourism in Central America

*Gino QUINTERO-VENEGAS, Álvaro LÓPEZ LÓPEZ (Mexico)*

Central America is a regionally integrated territory not only by historical and cultural elements but also by the tourism activity. This sector is seen as a driver of regional economic growth induced by the natural, cultural and human resources of each one of the countries in the region. Thus, transit tourists, understood as visitors taking scale in a country en route to another destination; use the Central American road infrastructure, the Pan American Highway, to move linearly, across the isthmus and gradually link their trip in every national capital. However, for visitors to move to the main tourist destinations, they use a range of personal motivations given in terms of time, expertise and money to generate very particular forms of movement within the destination. This paper therefore seeks to provide some conceptual and methodological contributions to define the causes of the mobility of tourists and unveil some of their territorial patterns.



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## The Effects of Distance on the Ecotourist Experience

*Laurent BOURDEAU, Pascale MARCOTTE (Canada)*

The purpose of this research is to analyze the effects of distance on the ecotourist experience. This research studies the effects of the distance between the place of residence and the tourist site visited on the ecotourist experience. This latter experience will be examined on the basis of the quality, but also of the values that tourists attribute to a national park, a tourist destination located in a remote area and far away from large urban centres. The data were collected from tourists who had rented a cottage located in a wildlife reserve or in a national park and who completed the questionnaire (n= 1 437). The cottages are located in different regions of Quebec (Canada). We used the postal code to calculate the distance traveled by the tourists up to the wildlife reserve or the national park. On average, tourists had traveled 1,603 km between their place of residence and the national park visited (s.d. 1,363 km). We observe that the further tourists live away from the national park, the more they give a positive evaluation of the ecotourist experience. Moreover, we checked to see if the other independent variables (e.g. gender, education) have a greater effect than distance on the ecotourist experience. Our analysis presents different effects between long-distance (i.e., trips greater than 100 km) and short-distance travel behaviour on the ecotourist experience.



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## Tour operation and travel agency services – capital concentration and centralization and production of space. An analysis on Brazilian case

*Rita CRUZ (Brazil)*

Introduction. The operation and travel agency are services that mark, objectively, the process of transformation of travel in a consumer good and therefore its conversion into a merchandise, as well as they star, in a general context of social transformation, a movement that goes from the consumption space to the space consumption (Carlos, 1999). In addition to a historical process, such changes relating to the universe of human spatial displacements, shelter economic, political, cultural and territorial contents to be examined. Since Robert Smart, considered a pioneer in steamships travel agency (Rejowski, 2008), began recording, in 1822, embarking passengers on those ships, profound changes reached the travel-related services sector. The very emergence of tourism as an organized business is part of this movement. The commodification of travel and its consequent transformation in business has spatial developments little studied and it's a purpose of this paper to analyze the relationship between operation and travel agency services and the production of space, taking Brazilian territory as a case study. Methodology. A historical analysis based on a dialectical method is the way by which we seek to grasp the conflictual and contradictory process of space production in relation to operation and travel agency services. Results. Regarding the organization of the sector, we find a strong process of concentration and centralization of capital, expressing striking features of the current phase of the capitalist mode of production. Furthermore, it stands out the dialectic between the production of representations of space and the production of the space of representation powered by operators and travel agents (Lefebvre, 1974).



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**An assessment of the performance of tourism at Mapungubwe National Park, South Africa**

*Innocent SINTHUMULE (South Africa)*

Mapungubwe National Park is one of the parks that were created to conserve both biodiversity and cultural heritage in South Africa. It has also been awarded the status of a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO). This study evaluates the performance of tourism at the park and the cultural landscape. Data on visitations and lodging occupancy after the Park was declared as a World Heritage Site were examined. In order to understand possible causes of tourism trends, visitation data was supplemented by social survey data. The study established that there is no sharp increase on the tourist numbers to the Park. In addition, bed occupancy is below 50% since the Park was declared a World Heritage Site. Potential barriers contributing to low bed occupancy are discussed. The study concludes that the World Heritage Site status did not trigger an increase in tourism in Mapungubwe National Park. Contributing factors are the remoteness of the area and its relative newness as a national park in South Africa.



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## The fundamental necessary condition of the conservation the World Ocean as a global tourist-recreational system

*Mikhail LOMONOSOV (Russian Federation)*

Recreational resources of the World Ocean are of priority significance for tourism. Its ecological state has a dominant influence on the natural-recreational potential of the seas and coastal areas, and is largely dependent on human activities, primarily related to the elaboration of mineral resources. The active elaborations of hydrocarbon deposits in the shelf zone, which lead to destabilization and degradation of marine ecosystems, represent the greatest danger for the World Ocean. Thus, there is a very real threat not only to the tourism potential, but and for civilization as a whole. Ecological Mega-catastrophe in 2010 on oil and gas deposits in the Gulf of Mexico is a warning for humanity. The author takes an active and direct participation in the development of a new method for operational distance research the Earth's natural resources. Its applying for the study of global hydrocarbon system of the Earth allowed to establish: the Earth has a hydrocarbon shell in the mantle, which fuels oil and gas deposits in the earth's crust; oil and gas should be attributed to renewable natural resources; hydrocarbon resources on dry land of the Earth practically inexhaustible. Developing of alternative hydrocarbon resources on dry land of the Earth should help to take off environmental load of the Ocean, to restore of its recreational potential and lost Harmony with Nature. Are given: justification of danger of exploitation of marine oil and gas deposits; examples of the reality and effectiveness of the new method of research of natural resources; examples of marine regions, where oil and gas activities poses a threat to tourism and recreation, and an optimistic estimate of hydrocarbon resources on dry land of the Earth in these regions.



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**Sustainability and nature-based mass tourism in China: Lessons from Huangshan**

*Xu HONGGANG, ZHUDAN, Bao JIGANG (China (Beijing))*

With the rapid growth of the tourism industry worldwide, the path towards sustainable mass tourism has become a critical issue for most destinations. Unlike most developed countries, China has its particular context for mass tourism development and is experiencing a trial process, pursuing sustainability through natural resource conservation and economic growth. The sustainable development is implemented through a top-down institutional arrangement. Through a system analysis of the path towards sustainable development of a typical nature-based mass tourism destination, Huangshan City and Huangshan Scenic Park, this research attempts to reveal its successes and challenges. The study finds that the Chinese government-dominated mass nature-based development model has brought a dual structure with a modern efficient management pattern at the attraction and municipal scales, and a backward unsustainable situation at the community scale. This study also reveals that this model has the risk of running into a potential path-dependence trap which creates barriers to pursuing an integrated resource- and community-based development. The study argues that while a government-dominated and learning-by-doing approach toward sustainability is practical, the lack of integrated and systematic planning leading to transformation of the society as a whole may also lead to a suboptimal situation.



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**Renewable energy sources use for energy supply of tourist and recreational clusters**

*Nina TETERINA, Ludmila NEFEDOVA, Sofia KISELEVA (Russian Federation)*

The possibilities of Renewable Energy (RE) sources use in energy supply systems of different tourist and recreational clusters are analyzed. RE can most effectively be used in national parks, islands and other isolated territories where the exploitation of diesel generators leads to environmental degradation and implies substantial operating costs. Islands are the most fragile ecosystems and their introduction to the tourism industry requires compliance with all key terms and principals of sustainable development. Tourism is one of the main sectors of the economy of most small island states - tourism sector as a proportion of GDP: the Bahamas – 65%, Antigua and Barbuda – 60 %, Barbados – 43 %. The possibilities of Renewables use for development of island tourist clusters are presented in three key sectors: energy sector (creation of mini-grid systems with RE generators and accumulators), transportation sector (biofuel from plants and organic waste), and construction sector (air-conditioning and water-heating solar systems in hotels). Some small tropical islands already have RE systems – Tokelau Islands, the Maldives, the Seychelles, Solomon Islands, Aruba, El Hierro, etc. An analysis of island states' RE development plans is conducted. The degree of utilization of RE Systems on islands of Russia is described: on Valaam, Bering, Popov, Russian. The main factors (energy, ecological, social and commercial) of Renewables use for energy supply of recreational clusters are defined. Reasons for introduction of a special block in the structure of the GIS "RES in Russia" (http://www.gis-vie.ru) which will provide information regarding projects for development of energy and heating supply systems in tourist and recreational clusters in Russia are justified.



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## Geographical Justification of the Conception of the Sustainable Development of Recreational Nature Management in the Region

*I.M. YAKOVENKO (Russian Federation)*

The priorities of the sustainable development of Recreational Nature Management (RNM) are complete satisfaction of peoples' recreational demands, achieving economic efficiency, high competitiveness of the region in the sphere of recreation and tourism and maintaining the quality of recreational environment. Development of the conception of the RNM sustainable development includes four stages: I. Geographical analysis of factors of the Recreational Nature Management: ¾ study of the dynamics of peoples recreational demands; ¾ assessment of natural, social, cultural (socio-cultural) and environmental resources and constrains of recreation and tourism; ¾ analysis of trends in the process of recreational areas development). II. Assessment of the current state of regional Recreational Nature Management: ¾ analysis of the functional and territorial structure of Recreational Nature Management; ¾ assessment of the intensity of recreational activities; ¾ assessment of the quality of recreational environment and regional ecological and recreational situations; ¾ detection of the urgent problems of recreation and tourism development in the region. III. Development of spatial models of sustainable development of Recreational Nature Management. IV. Development of the strategy of the sustainable development of Recreational Nature Management in the region: ¾ choice of priorities of socio-economic development of the region; ¾ justification of the sustainable development of recreational land use, recreational forest management, recreational water management; ¾ development of recommendations for the prevention of conflicts; ¾ designing a system of recreational greening process and rational use of the resources potential; ¾ justification of the mechanism of the regional governance of Recreational Nature Management.



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## Social evaluation of San Pedro Atlapulco's sustainability

*Lilia ZIZUMBO-VILLARREAL, Neptalí MONTERROSO-SALVATIERRA; Alejandro PALAFOX-MUÑOZ; Graciela CRUZ-JIMÉNEZ; Ana Luz QUINTANILLA-MONTOYA (Mexico)*

San Pedro Atlapulco is a rural community of indigenous origen, located in the natural area better known as 'La Marquesa' (Miguel Hidalgo y Costilla, National Park), located in the State of Mexico, due to its geographic location it's a space with plenty of vegetation: forest, valleys, plains, rivers and aquifers. For some time, the residents have left their traditional agriculture exploitation to participate in tourism services, which has modified their quality of life and the management of their natural resources. The objective of this research was to evaluate with social indicators, the sustainability of the management systems that the community has established in order to use the natural resources they have; the purpose is to find the information that allows them to improve them or in case its needed substitute them. The methodology used was based on the proposal named 'Framework for the Evaluation of Natural Resource Management Systems Incorporating Sustainability Indicators' (MESMIS) with some adjustments in order to be able to apply quantitative and qualitative methods and techniques from anthropology and sociology, to focus the evaluation. The results show that the systems for the management of the natural resources for tourism has allowed the improvement of their quality of life, but has originated pressure over the environmental services. Even If the new productive activities have been financially successful they're not sustainable, there for, is necessary to raise awareness within the community about their current situation and the ecological, economic and social impact that their economic activities cause. There are favorable factors to implement social development programs.



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# Residents' Perception Of Scenic Development Enterprises' Corporate Social Responsibility : Perspective Of Place Attachment

*Zeng LIPIN, Lin HONGXIA (China)*

In the process of tourism development, enterprises are usually criticized for the irresponsibility for the destination development, their only concern is profit and business success. However, the scenic development enterprises are getting profit directly from the heritage resources, which are considered to be the most important public resources, and it's highly attached by local people and tourist, increasing conflicts arose between local community and the developers due to the reason of responsibilities understanding difference in the past years, thus the Social Responsibility of Scenic Development Enterprises plays a significant role for sustainable development in heritage site, but how the other stakeholders perceive the enterprises' CSR has been ignored in the past decades, in response to this literature gap, the paper chooses Wulingyuan as a research site to collect data, where is one of the top natural heritage tourism destinations in China, and there are numbers of scenic development enterprises who have close link with the local people, 332 valid questionnaires were collected from the local people. After liability and validity analysis, the result of questionnaire survey were analysed by using the exploratory factor analysis and the regression analysis. The results testified the hypothesis model about local residence place attachment and cognition of heritage values and their perception of scenic development enterprises' CSR. The findings are: ①Residents expect that scenic development enterprises should be responsible for shareholders, visitors, employees, heritage and the government, particularly the environment and community residents; ②Those residents, who have a stronger sense of place attachment and stronger cognition of heritage values, often have a higher expectation on scenic development enterprises' CSR; ③By strengthening local residents' cognition of heritage values, place attachment deepens their perception of scenic development enterprises' CSR. The implication of the research indicates that Scenic Development Enterprises should be more responsible for the local community and the environment, and strengthen communication with residents to assume their sustainable development, the local government should better to enhance the place attachment of local residence to ensure their responsible behavior. The findings also indicate that place attachment can not only improve the residence themselves responsible behavior, but also their expectation for "others" responsible behavior, and the statement of the value of the heritage means the responsibility for the local people, by enhancing the heritage value identification of local residence, it can increase local people's expectation for the enterprises' CSR, accordingly, the enterprises will have to be more responsible in response to the local residence's expectation, which will make the destination more sustainable.



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## Tourism in areas prone to natural risks: danger and attraction

*Elena PETROVA, Yury MIRONOV (Russian Federation)*

The paper discusses how to manage tourism development in areas at natural risk. Although mountain areas and sea coasts are prone to risks of various natural hazards and disasters, such as earthquakes, tsunamis, volcanic eruptions, debris flows, snow avalanches, landslides, etc., they attract the largest number of visitors and are widely used for tourism and recreational purposes. Therefore, it is very important to manage visitor flows in such areas to create opportunities for tourism activities, on the one hand, and reduce dangerous impacts of natural hazards on tourists to the possible lowest level, on the other hand. A long tradition of using areas at natural risk for tourism purposes have such countries as Japan, China, and Italy, which, for example, have very useful and interesting experiences in the development of recreation and tourism in areas of active volcanism (Aso and Usu volcanoes in Japan, Etna in Italy, Yangmingshan National Park in Taiwan, etc.). Despite the real danger coming from volcanoes, they are among of the most attractive natural sites. In particular, it confirmed interviews that we conducted at university centers of Russia and Japan in the framework of a joint project; all respondents evaluated volcanic landscapes as very attractive, as compared to other types of natural landscapes. Other examples are areas in Japan most affected by the earthquake and tsunami of March 11, 2011. There are suggestions to develop in these areas the so called "recovery tourism" that will support the restoration of affected communities.



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## Tourism, Landscape, and the Natural Environment

*Vivek MAHAJAN, Rajender SINGH (India)*

Tourism, Landscape, and the Natural Environment Dr. Vivek Mahajan* University of Jammu, Jammu and Kashmir, India. Email-vivekmjuindia@gmail.com Abstract Tourism is an intensely geographic phenomenon and is related to the structure, form, use and conservation of the landscape. Landscape constitutes a most significant geographical medium in the analyses of relationships that develop between tourist and visited location. It is a valuable means and tool of analyzing geographical change through tourism. Tourism can bring both positive and negative impacts to an area. It affects the landscape in two ways first by changing the appearance of the land with the construction of roads, resorts, hotels, restaurants etc. and second, by processing its natural beauty with establishing wildlife sanctuaries, natural reserves and national parks. Tourism affects the natural environment which is the biggest concern for the destination communities. Successful tourism development leads to increased tourist traffic and the possibility of visitor-induced stress on a community's natural environment. This problem is acute in the areas receiving large number of tourists. This research assesses the current environmental position of the tourism industry in India and formulates suggestions for future direction in regard to mass tourism to responsible tourism. This study recognizes the critical problem of inadequate understanding of the environmental impact of concomitant activities and the lack of knowledge regarding ecological practices. The paper concludes by identifying key questions and research needs which should be addressed. Keywords: Tourism, Landscape, Natural Environment, Destination, Communities, and India. *Dr. Vivek Mahajan, presently working in University of Jammu (Jammu & Kashmir, India) as a Computer Assistant, got his master's and Ph.D. degrees in Geography from the same institution. His additional qualifications are Master's in Tourism Management and Post Graduate Diploma in Computer Applications. Has qualified NET in Geography. He served as Guest Faculty in Global Understanding Course offered by University of Jammu and also in the panel of academic counselors of Indira Gandhi National Open University (IGNOU) with study centre at University of Jammu.



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## Virtual ecological paths as a new tool of eco-tourism

*Maria TSEKINA, Vadim KORBUT (Russian Federation)*

Any kind of tourism must take into account the properties of resources in which they are held. The eco-tourism is a complex phenomenon: on the one hand, there is a demonstration of "interesting" objects, on the other - their destruction. Visitors of any status protected areas should be a base prepared. He should know the basic things about the nature and culture of the study area as a whole, as well as an understanding of the key factors on which it can construe about the environment. Of course, person receives a basic knowledge of science and the humanities at school, but the systematization of knowledge and ability to apply them in the interaction with the nature is possible only with the direct contact with nature. Preparing such a systematization can be facilitated by the use of such virtual nature paths. In our view, the virtual nature path is a set of interrelated digital images arranged in a specific sequence of natural phenomena and objects with the application of text content. This set is demonstrated to tourists. It consists of the blocks and modules. This structure allows increasing or decreasing the "route", depending on the task. The block-modular design of the virtual nature path allows to form a general way for a new look on the scientific activities in protected areas, conservation work and, ideally, - on environmental management. Also block-modular principle as a storage of information creates a labile, modifiable and adaptable virtual path for applications for any target audience. In addition, it has a particular importance for persons with disabilities. The virtual nature path enriches the image of the world of the individual, increases the environmental values of the area.



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## "China Watching": The making of a collection in Journal of China Tourism Research

*Honggen XIAO (*China*)*

This article offers a post hoc reflection upon the publication of a special collection on "China Watching" in the Journal of China Tourism Research (Volume 8, Number 2, http://www.tandfonline.com/toc/wctr20/8/3#.VNCBwE39nrc). The emergence of and worldwide interest in China as a leading origin and destination and the accompanying consequences and implications have made the theme a timely topic in tourism studies and a good match for this Routledge quarterly, which commits to publishing multidisciplinary tourism research relating to China and/or the Chinese. Built on (and recalling from) expressions of interests, submissions, reviews and revisions, and consequent (or subsequent) interactions amongst authors, reviewers, and editors, "China Watching" as a special issue is reflected in paradigmatic terms. With instances from this collection, the critique speaks of the ontology, epistemology and methodology in this array of diverse topical coverage. From an evolutionary standpoint, inter-/multi-disciplinary perspectives such as (cultural) geography, sociology/anthropology, cross-cultural communication, journalism/media studies, as well as cultural studies perspectives are indiscernibly embedded in this collection of China tourism studies, which quintessentially and eloquently addresses issues relating to cultural identity (or Chineseness), cultural encounter with China/Chinese through tourism, cultural representation of China/Chinese for/in tourism, and the mutual gaze resulting from "foreign visitors in China versus Chinese travelling to foreign destinations" in the era of global tourism. From a mutually evolving perspective, geographical contributions to changing tourism research will also be discussed.



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## Compiling the Dictionary of Tourism (Nature-Culture-Travels) in five languages

*Anna KOMAROVA, V.M. KOTLYAKOV (Russian Federation)*

The talk describes the multilingual Dictionary of Tourism (Nature – Culture – Travel) compiled by V.M. Kotlyakov and A.I. Komarova and published in 2013 with the support of the Russian Geographical Society. The Dictionary contains 4350 essential terms, currently used in diverse branches of modern tourism, covering general concepts, types of tourism, maps, organization of tourist business, transportation, infrastructure, physical environment, natural heritage, cultural traditions. The talk explains the methods used for selecting terms to be presented in the dictionary in a systematic way. It also surveys the stages of lexicographic work: the wordlist formation, creation of short definitions for each term in Russian, finding equivalents in English, French, Spanish and German. The characteristic features of tourism terminology: synonyms, borrowings from English and the scope of the terminological system of Tourism is analyzed.



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## Science Of Tourism As Integrative And Imperative Branch Of Geography

*Iu. N. GOLUBCHIKOV, V.I. KRUZALIN (Russian Federation)*

Tourism entered in the sphere of interest of many sciences. It is exposed a tension between the institutional and intellectual positioning of tourism studies. From an institutional perspective departments of tourism focus on geography departments of European universities. The rest of the world, most tourism departments and programs are located in business faculties. In the North American tradition they are focusing on special departments devoted to leisure and recreation study [Benckendorff, Zehrer, 2013; Müller, 2014]. In Russia about 600 higher educational institutions prepare students for tourism specialties. At the same time the network analysis of publication activity in the tourism sphere determines its intellectual orientation in the field of social and geographical sciences. At that in tourism studies it is noted the weak representation of influential authors in so important spheres for tourism as philosophy, literature, history, religion, linguistics, political science, media studies and law [Benckendorff, Zehrer, 2013]. In geography sphere the skeptic relationship to tourism as a science takes place sometimes. It is pointed a little quotation of articles on tourism and tourist geography by geographers. Tourism journals are not included in the most esteemed journals in various ranking systems [Hall, 2013]. Nevertheless the science of tourism (geotourism) is increasingly realized as a source of geographical knowledge and an important point of integrative intersection of geography disciplines. Geotourism already played a significant role in dedifferentiation of wide range of geographical, service, educational and healthful branches.



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## Governing Sub-Arctic Tourism: Public Stakeholders' Perspective on Tourism Development in Swedish Lapland

*Dieter K. MÜLLER, Louise ROBERTSSON (Sweden)*

Tourism development in peripheral areas has been a frequently studied field. Despite a lot of promises stakeholders' in northern areas continue to struggle for a positive tourism development. In more mature destinations like the Swedish North various models have been applied during the years though not always entailing the desired outcomes. Hence in this paper we ask how governance models influence the development of tourism. This case study of Swedish Lapland, a peripheral region with challenges related to accessibility and seasonality, has looked on existing tourism development and has sought the perspective of local public stakeholders. The focus has been put on the problems and possibilities for tourism development in mentioned region, and interviews have been carried out with public stakeholders involved in tourism. Generally, the opinions of the stakeholders are in accordance with previous research. One finding is that more focus has been put on coordination and prevention of problems associated with peripheral tourism development rather than finding a common path towards future development. The risk is that this leads to unplanned, uncoordinated and chaotic development.



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## Landscape - ecological support of the paleontologically oriented National park in the New Siberian (Novosibirskiy) archipelago

*Grigoriy V. KAZACHKOV, S.V. LEVYKIN, A.A.CHIBILEV, G.V. KAZACHKOV, I.G. YAKOVLEV, D.A. GRUDININ (Russian Federation)*

According to RGS expeditions range "The Novosibirskie islands" in 2011-2013 and implementation of the project Program of Fundamental researches RAS 44P "Searching fundamental scientific researches for the Arctic development in Russian Federation", it is revealed the special specific of nature heritage of the New Siberian (Novosibirskie) islands which connected with mammoth's steppes in late Pleistocene. It is defined modern problems to conserve paleontological remains and relict loess – glacial formations (edoma) due to rush demand in collecting of mammoth ivory under increasing world prices and uncertainty of the recourse federal status. It is developed a special concept of the paleontologically oriented National park based on the most competitive tourist brand in the New Siberian (Novosibirskiy) archipelago – mammoths complex, the most prominent biological symbol of Steppe Arctida and edoma – its phenomenal lithogenous basis. Motive power for development of the brand can be an idea to understand mammoths world, including for its revival, and global Pleistocene boom. On the basis of this brand there is developed ecological –economical support for the paleontologically oriented National park. According to results of field researches, it was offered area zoning and separated out zones: reserve, touristy, traditional nature management, a rest zone for sea mammals migration, an off-site use zone. It was developed six tourist routs. There was estimated potential development of the area on the principle Pleistocene park, it was considered opportunity to increase food supply under climate warming in the Arctic. It was created a basic principle to develop Pleistocene park: reconstruction of mammoth megafauna at the expense of income from ordered collection and realization of mammoth ivory.



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## Local Tourism and Recreation as a Key Factor of Human Well-Being in the Circumpolar Territories of Krasnoyarsk Region, Russia

*Elena GUK (Russian Federation)*

In XX century, northern territories of Krasnoyarsk Region, developed as areas of traditional land use in the past, were started to be managed as new industrial areas. One of the largest mining plants in Soviet Union was built above 69°N, reasoned emergence of Norilsk – one of the most populated cities behind the Northern Circle. Limited transport availability and remoteness of the newly built area in combination with hazardous climate and industry caused creation and development of local recreation practice. Started in 1940s, dozens of camps and recreational centers were established in the neighborhoods of Norilsk and on the lakeshores of Western Putorana Plateau, an unique basalt landscape hundred kilometer east of Norilsk industrial area. In XXI century, Norilsk is populated approx. 170,000 and estimated as one of the polluted cities in the world, practically managed by Norilsk Nickel mining company. Despite partly subsidized transport connection with southern regions of Russia, capacity is limited, consequently local tourism and recreation are on demand. As a result of the fieldwork done in 2013, the following main forms were identified in the region: self-organized active tourism (rafting, cross-country skiing and trekking), recreation in employer-owned summer and year-round camps and in vacation homes. Inbound tourism is rare due to lack and expensiveness of infrastructure and mainly aimed at Putorana Plateau. The study has found that local tourism and recreation is an important part of everyday living of area inhabitants, not only due to its necessity for health support in polluted conditions but also because of lack and underdevelopment of other services, including transportation, entertainment industry and shopping facilities.



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## Tourism development governance in the Russian Arctic: examples from Nenets AO and Sakha Republic

*Albina PASHKEVICH (Sweden)*

Challenges in the roles played by public and private sector organizations in the sustainable tourism development are identified for two of the Russian Arctic regions: Nenets Autonomous Okrug and Sakha Republic. A review on the existing institutional arrangements is made including the public sector (regional and local levels), private entrepreneurship, local communities and the ways the participatory decision-making process is promoted. The evaluation of the outcomes of the present institutional framework prove to be unbalanced in order to facilitate coordinated tourism development. Furthermore, the issues arising from the unclear institutional setting influencing the creation of an integrative system of tourism distribution channels. This situation weakens the roles played by all stakeholders and gives fewer incentives for the private businesses and local communities to be involved in the tourism development activities. Key words: Institutional framework, Russian Arctic, public-private partnership, tourism development



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## Iconic Houston: Induced Images of Gastronomy on the Official Visitors Site for Houston, Texas, USA

*Velvet NELSON (USA)*

Urban tourism development in the U.S. city of Houston, Texas has been hindered by a negative reputation. This is based on persistent stereotypes, such as a predominance of chain restaurants and a limited choice of cuisine. In the past few years, however, the city has received new attention nationally, primarily based on award-winning chefs and distinctive, locally driven restaurants. Travel guides and magazines have named Houston the country's "newest capital of great food" and its "most exciting food city". With this interest in Houston's gastronomy, the Greater Houston Convention and Visitors Bureau (GHCVB) features food, drink, and restaurants prominently on the official visitors site for Houston (www.visithoustontexas.com). As the primary marketing organization for the City of Houston, the GHCVB plays an important role in influencing destination image. This research examines the induced images communicated in the fifteen gastronomic-themed pages of the Visit Houston site. Content and narrative analyses are used to identify key themes and to explore the descriptions and images employed to communicate the story of Houston as a gastronomic destination. While previous research indicates that the organic images produced in travel guides and magazines highlight the city's new gastronomic developments, findings from this study show that the GHCVB site provides a history and context for these developments. Using a locally-voiced narrative, these induced images suggest that visitors can now experience what locals have long known.



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## The Label of the UNESCO World Heritage List : Commercial Developments and Symbolic Appropriation of Territories

*Laurent BOURDEAU, Etienne BERTHOLD (Canada)*

Most of the time, the inclusion of a site on the prestigious UNESCO World Heritage List rises significant tourism benefits in terms of frequentation and development of local amenities (hotels, restaurants, shops, etc. .). But as it is underlied by a universally recognized label based on heritage and tourism values, the UNESCO World Heritage List also allows the enhancement of territories. This presentation will focus on two forms of territorial enhancement induced by the inclusion on the UNESCO World Heritage List. On the one hand, a commercial development of local products inspired by the UNESCO label. The case of Quebec City (Canada) and Bordeaux (France) are particularly relevant in this regard as they both experienced commercial developments based on the UNESCO label. On the other hand, a symbolic appropriation of territories by local populations. In this regard, the presentation will explore the processes by which residents and pressures groups are likely to evoke the inclusion on the UNESCO World Heritage List in opposition to certain real estate and urban developments. In this perspective, we will explore two controversies that marked the social landscapes of Quebec City and St. Petersburg between 2008 and 2010. In Quebec City, the demolition of the Patronage St Vincent de Paul, a convent property situated in the protection area of the World Heritage site district, and in St. Petersburg, the project (not completed) of a huge building by the national GazProm that was intended to take place in the heart of the historic district.



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## The Victoria & Alfred Waterfront as playground for Capetonians

*Sanette FERREIRA, Rozitta De VILLIERS (South Africa)*

The paper contributes to the exploration and understanding of the social geographies of public space in the Victoria & Alfred Waterfront (V&AW) in Cape Town. The aim is to understand Capetonians' (visitors and employees) perceptions of the V&AW as public, leisure, shopping and working spaces. The appropriate literature on waterfront developments in providing public, working and leisure space is reviewed. Two questionnaire surveys (visitors and employees) as well as eight unstructured interviews with important role players in the tourism industry of Cape Town were conducted. Findings revealed the most important reasons for Capetonians to visit or use certain spaces in the V&AW, the public open spaces they liked and how they perceived the V&AW as an inclusive space. The research also sought the respondents' views on how the certain public spaces can be improved; what new activities and retail shops can be introduced; their opinions about the affordability of restaurants and parking; and how the V&AW can improve to cater for the needs of the Waterfront's employees. Recommendations are made for making the V&AW more functional and accessible to Capetonians.



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## Developing a major tourism cluster in Val d'Europe?

Anne-Marie D'HAUTESERRE (New Zealand)

This presentation seeks to examine the urban project in the Eastern Paris Basin as attempts are formulated to transform it into a major tourism cluster in Europe. This direction seems to have prevailed over the earlier one of creating an urban centre to counterbalance developments closer to Paris within Marne-La-Vallee. The Disney parks are to anchor other projects initiated by the Walt Disney Company, such as "Villages Vacances" to be built by Pierre Vacances, the largest French builder of holiday homes and centres, as well as by other providers of attractions and kinds of tourism services. Has there been a 'rethinking' about how to organize the production and management of these urban spaces, or have old modes just been 'tourismwashed'? What does Val d'Europe seek to offer: a high, urbane, quality of life that attracts residents and enterprises? Are the tourist venues the main attraction for them? Has this urban area developed activities and attractions beyond just tourist services? Or is that whole urban setting a (or the) tourist attraction? How successful can it become (and remain) as a tourism cluster? Will that transform it into an aestheticized urban space shunned by future urbanites? These are some of the questions that this presentation will attempt to answer.



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## A Comparison of the Characteristics of Japanese and Foreign Travel Guidebooks

*Shun-ichi YOKOYAMA, Naoko HASEGAWA (Japan)*

Tourist guidebooks represent what tourists seek in terms of travel. Major contemporary Japanese tourist guidebooks are very visual; they frequently contain many large pictures and little text. On the other hand, other countries' guidebooks, such as those by Lonely Planet and Michelin, contain a lot of text and few pictures. What explains this difference? We speculate that it is influenced by Japanese manga and Japan's group tourism culture. In Japanese elementary school classes, children use texts with Doraemon or manga-like illustrations, while a brochure for adults produced by the Japanese Ministry of Health, Labour and Welfare uses manga to explain the national pension system. Thus, Japanese people of all ages are familiar with manga as an educational tool. Additionally, Japanese people like rankings. Consequently, they prefer to buy visual guidebooks with many pictures and little text. Unfortunately, such guidebooks contain very little in the way of explanations of regional geography. The second influence is Japan's predominant travel style. Japanese people travel frequently as part of group tours, which visit the most common famous destinations, such as important temples and sites. Group tours are accompanied by tour guides who explain the background of each destination so that travelers do not need to read explanations on their own. In addition, Japanese people are easily influenced by visual images, which provoke in them the desire to visit the sites in the images they see. Most Japanese people want organized travel, not discovery or exploratory travel. They want to do the things that many people have already done or that are represented in the guidebooks as the most visited or most indispensable places. In the future, we wish to develop high-quality innovative travel guidebooks for general readers from a geographical perspective by conducting a comparative analysis of Japanese and foreign travel guidebooks.



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## Dark Tourism and Hansen's Disease Sanatoriums

*Akira IDE, Tomohisa TAMURA (Japan)*

Dark tourism is a relatively new tourism concept. In this report, we would like to pick up examples of Hansen's disease sanatoriums especially in the context of Japan's situation. Focusing on the problem of Hansen's disease has two aspects of importance. The first is to memorize the tragic isolation of Hansen's disease patients in Japan. Many advanced countries released cured patients after better medical treatments were developed. In Japan, there were many residents in Hansen's disease sanatoriums even after they had recovered. Some researchers have pointed out that this kind of situation might be compared to Nazism. The second is that this problem does not occur only in the distant past. After the Great Japan earthquake in 2011, the Fukushima Daiichi Nuclear Power Plant was destroyed by a tsunami, and many rumors about radioactivity spread widely. Fukushima farmers were struggling with many rumors that vegetables were polluted with radioactivity or that child cancer rates were increasing. Of course, these kinds of rumors have no basis of theoretical legitimacy. In fact, the same situation can be seen in the history of Hansen's disease. Prejudice towards those with Hansen's disease continues. The reason for this prejudice is that we do not know the truth about Hansen's disease. The same structure can be seen in the case of Fukushima. As we do not know the truth about the disaster, many people feel anxious about the effect of radioactivity. In this context, the core of the problem is the unknown. Therefore, studying the history of Hansen's disease has modern meaning in terms of discrimination or prejudice.



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## Evaluation of recreational resources and recreational potential in the development of tourism

*Tatiana VOLKOVA (Russian Federation)*

There are several common approaches to the valuation of recreational resources that have been estimated and first of all their functional suitability for a particular type of tourism; the degree of comfort; aesthetical qualities. In addition, the identification of recreational value of a resource includes economic and environmental evaluation. In most cases recreational potential determines the recreational specialization of each particular territory. Subject to the obligatory presence of the recreational potential of each particular area extent of its use may vary due to various reasons. Moreover, in some cases, the use of recreational potential may not be appropriate for different reasons. To determine the degree of the usage of the recreational potential is appropriate to apply the following formula: KR = f/l, where KR is the index of utilization of recreational potential; f is the actual number of holidaymakers per area; l is carrying capacity, i.e. a limit, namely the number of holidaymakers that area can take without irreversible consequences. If the index of utilization of recreational area in the specific area is less than 1, the use of recreational resources are insufficient, that have the opportunity to take more tourists than assumed at the time of the study. If the index of utilization of recreational resources is 1, then the maximum number of holidaymakers is reached and there is no need to attract tourists. If the index of utilization of recreational resources is greater than 1, the number of tourists in the area exceeds the allowable limits, which can lead to the depletion and destruction of recreational resource or a sharp decrease in the psychological comfort of guests.



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## Formation d'une nouvelle stratégie de développement des territoires du Nord

*Elena TOTONOVA (Russian Federation)*

Technologies de l'information et de la communication d'aujourd'hui convertissent tous les secteurs de l'économie. Aujourd'hui, le tourisme est l'une des industries les plus importantes d'e-commerce. Nombre d'entreprises de tourisme d'affaires électroniques de plus en plus rapidement, augmentant public de consommateurs de services touristiques et l'accès aux réseaux électroniques. L'amélioration continue de l'entreprise touristique et l'utilisation des nouvelles technologies. Avec le développement du tourisme population locale maintient son mode de vie et la nature traditionnelle devient un facteur majeur dans le développement de l'entrepreneuriat dans le Nord. En conséquence, l'activité touristique locale passe à s'adapter à l'évolution des exigences du marché (l' expérience des territoires du Nord Canada) grâce à l'innovation et la diversification des services touristiques (tourisme dans le Nord), l'utilisation rationnelle des ressources nationales (traditionnelle des terres) et l'intégration (intégration des entreprises de tourisme). Le résultat est la formation d'une économie «mixte», qui est activement pratiqué dans le Nord du Canada. Ainsi, le développement du tourisme dans le Nord peut devenir le moteur de l'économie locale, conduisant à la formation de centres locaux de tourisme . Il s'agit d'une nouvelle organisation spatiale des territoires du Nord.



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## Geographical analysis on taking photographs in the guided tour: a case study of experimental group tour in Izu Oshima Island, Japan

*Takuya KOIKE, Koun SUGIMOTO, Toshio KIKUCHI (Japan)*

Taking photographs by tourists is one of major topics in previous studies of tourism science and geography. Some studies clarified the spots, objects and time taken photographs frequently. These studies have revealed to behavior of taking photographs for individual trip or under the condition made by researcher. Meanwhile, this study attempts to analyze about taking photographs by participants of guided tour. In recent years, because of diversification of individual preferences and interests, guided tour is the basic type of tourism in order to satisfy demand of tourists. The interpretation by tour guide can change worthless local resources to tourist attractions. Furthermore, the guided tour have an effect to satisfy a thirst for knowledge for tourists. Thus this study aims to clarify the impact that interpretation by tour guide gives interests to tourists. The investigation conducted in experimental group tour held in Oshima-cho, Tokyo Metropolis, Japan. We collected photographs taken by more than twenty participants of insiders and outsiders of Izu Oshima Island, and recorded voices of interpretation by tour guide. Hence it is clear the kind of photographs taken by participants when tour guide interpreted. Moreover, if there is a place where participants take photographs frequently without interpretation by tour guide, there is a possibility that the place become new tourism resource.



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## Landscape Structure Of Territory The Cheboksary Agglomeration For Recreational Use

*Anna GUMENYUK, Inna NIKONOROVA (Russian Federation)*

The article discusses the landscape structure of Cheboksry agglomeration. Recreation specialization by the seasonal and age preferences of the population is given. The right bank is mainly of sports specialization by the functional use, and the left bank - Therapeutic recreation. Planning structure of the city should be a relief area formed by tributaries of the watershed the Volga River: Cheboksarka, Sugutka, Trusikha, Kaybulka that spray in the meridional direction. As a consequence, the main city buildings are located on watersheds and form a wedge-shaped area of administrative regions converging amphitheater in the Volga Bay, and expanding to the south. All major highways are laid on the upper elevations of the watershed ridges and form a radial system of streets converging to the Gulf of the Volga River. Landscape differentiation of the territory the study we are examined by the level of structural units of the landscape as the types of terrain. On the territory of the study we observed the following types of areas: 1) watershed terrain; 2) the valley type of terrain of small rivers; 3) the slope type of terrain of the right bank of river Volga (Cheboksary water reservoirs); 4) floodplain-terraced terrain. The highest assessment of the natural and recreational potential for all populations obtained for floodplain-terrace-type of the area. The lowest rating of potential corresponds to slope, watershed and valley terrain types.



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**Possibilities and Limitations of the Exchanges between Urban Areas and Rural Areas in Japan**

*Kosei YAMADA (Japan)*

In Japan, it has been the problem or the decline in mountainous areas for a long time. One of the solution is the exchange between urban areas and rural areas. For the maintenance and the promotion of rural areas, support from the outside is necessary without exception. Rural tourism, utilized resources of rural areas, is performed in many regions, and the exchange by the university students in urban areas is increasing now in Japan. This study examined possibility and limitation of the exchange between urban areas and rural areas while clarifying the present conditions and problems in rural areas through exchange program with university students. The activities of thirteen universities which performed the exchange program between rural areas in Saitama Prefecture in 2012 are mainly divided into three types. The first is the experiences of farm work and the staying farmhouse, the second is the participation to the festival and the event in rural areas, the third is the investigation and the evaluation of rural resources such as the local food and old tale, culture. According to the activity report, it wasn't seen the opinion such "it brought economic effect" and "the population decline was stopped". In contrast, it was seen many opinion that "they were happy to exchange with youth". Nowadays, social effects are demanded in the exchanges between urban areas and rural areas rather than economic effect. And the exchanges between urban areas and rural areas are enabled, if it continues. However, it remains a few problems to build a system and structure to continue the exchanges between urban areas and rural areas.



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**Reuse of cultural resources and walking tourism in France －A case study of the "Stevenson trail"**

*Yasuo ICHIKAWA (Japan)*

In recent years, amid growing interest in health and the environment, trekking ("walking tourism") has boomed and attracted attention, assisted by the development of trails and footpaths. A general term for this walking activity in France is "Randonnée" and this is the sport most people prefer. (Pole Resources National Sports de Nature 2011). The objective of the research is to clarify the relationship between cultural resources and tourism, by focusing on the use of travelogues in trekking tourism in the Cévennes region in France. The travelogue that is used as a cultural resource is Travels with a Donkey in the Cévennes (1879), written by Robert Louis Stevenson (1850–1894). This study uses three major data sets, the management process for cultural resources, the operation and activity of the Association "Sur le Chemin de R. L. Stevenson," and a questionnaire survey of travelers. The results can be summarized as follows. Trekking tourists consumed the cultural resources as a rural experience, and their major interests were "cultural resources," "own experience," and "relating culture to the area." In addition, trekking tourists were also interested in acquiring an understanding of regional and cultural factors. Tourists were mostly driven to join a trekking tour of the Cévennes by a desire to explore unseen land and take in the terroir of mountain villages. The Stevenson Trail is considered a type of tourism activity that enables trekking tourists to interact with culture, nature, and terroir.



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## Territorial organization and development of the museum tourism in Krasnodar region

*Vera MINENKOVA, Anatoly FILOBOK, S. KIRILICHEVA, M. BELIKOV (Russian Federation)*

During centuries the necessary condition of every trip was the visit of local sights. Among them the special role was taken to museums. Museums are the "keepers" of knowledge, including the area of art. A museum and tourism are closely connected. Quite often a trip or journey to other city is begun with an acquaintance with a museum - keeper of cultural memory of region. A museum is an original tourist resource. Krasnodar region by virtue of the geographical location, since time immemorial is the place of crossing of different cultures, people and traditions. Thus, it carries in itself historical, cultural and tourist potential. Presently 60 museums operate on territory of the region. From them 24 state and municipal museums and their branches, including 2 museum-reserves of federal value, 19 museums historical, archaeological, regional, literary-memorial profiles, 2 artistic museums in Krasnodar and Sochi and 1 show-room. An ethnographic complex "Атамань" is a natural ethnographic standard of the Kuban cossack culture. It is the largest and unique outdoor museum. Annually about 2 million persons visit state and municipal museums. Except the function of prominent tourist sights museums can also play the important role of guide-books on geography of cities or countries. It is special justly relatively small regional and historical museums that serve as illustration or short introduction to geography and history of this territory or certain epoch. Today among the major indexes of socio-economic development of Krasnodar region, by the original barometer of state prosperity, undoubtedly, there is the state of culture. The higher its level, the more civilized world we live in. It sets the modern vectors of development of culture of such bright, original region, that Kuban is.



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## Territorial organization of collective and individual accommodation facilities in Israel

*Anatoly FILOBOK, Yuri KHOROSHKIN (Russian Federation)*

Subject of research - the territorial organization of accommodation in Israel. Topicality of the research caused the following: understanding of the specifics of the tourist center allows to plan the accommodation facilities layout more qualitatively with taking into account the current needs of tourists, and as a result has an influence on the increase of the tourist flow. The research contains the analysis of the territorial organization of accommodation. As it turned out they mostly placed on the coastal areas. Accommodation facilities are mainly collective, but individual ones have a quite big fraction on the online booking services. The reason of it is the lower price. It was found that the quantity and the quality of the hotels are directly correlated with the specifics of the tourist center. Thereby availability of the sufficient quantity and quality of accommodation facilities would boost the tourist flow and as a result the state's economics in whole.



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## The environmental and economic impacts of moorage marinas on the West Coast of the United States

*Nathaniel TRUMBULL, Christine BAE, Jon IHNJI (United States of America)*

Marina development is increasing in almost all coastal areas, but especially on the West Coast of the United States. Local governments are interested in increasing revenues from mooring fees, and the local population supports marinas for the public enjoyment. The trend will continue: the amenities and the weather of the West Coast are suitable for the boat users with very little downtime. However, there is lack of research on how mooring facilities harm the marine environment and shoreline health as a result of oil spills, soap and waste discharges and other environmental consequences and the extent to which these are offset by regional economic benefits. The study will examine the full range of these issues in Washington State and California. A major data source is information from NOAA's National Mussel Watch since 1986 for the environmental implications of marinas, complemented by data from the US Census, the Economic Census Bureau, and local governments. This research seeks to analyze alternative mitigation and economic promotion scenarios for coastal development strategies. The policy goal is to find ways of reducing the environmental costs with minimal damage to the substantial economic and social benefits.



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## The impact of recreation on vegetation and soil in protected areas in Sevastopol

*Ekaterina KASHIRINA (Russian Federation)*

The landscape structure of the coastal zone of the state landscape reserves «Cape Aya», «Cape Fiolent» and «Baydarsky» (Sevastopol region, south-western Crimea) was studied. The map of the landscape structure has been built by program MapInfo with the including: terrain, type of terrain, landscaped estate, settlement, hydrological facility, tourism infrastructure, tourism activities, roads and paths network, the type of plant formations, the area of the polygon formations. Impacts to vegetation from the tourism activities and use of infrastructure were localized. Indexes of the roads and paths network density for different landscapes on cartographic data were calculated; ranging of the anthropogenic load has been conducted and its relationship with different types of coast has been defined. The coastal zone landscapes with the highest threat from tourism activities was identified in accordance with research results. Measures to protect the conservation area and valuable plant formations and the optimization of the existing nature reserve were proposed.



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## The structure of conflict among stakeholders in residential-touristic urban areas

*Kyung Eun LEE (Republic of Korea)*

Many alleys within old villages became an attraction, hot spot by local policy to vitalize their local places. Let us think about that;"Is this space for residential or passing-through or sightseeing?" We used to trip far away from our town a long time ago, like beach, mountain-climbing, extra. But recently many people seek to go somewhere close to where they live,particularly within urban spaces like old-fashioned villages, shabby streets. It's kind of a trend occuring in post-modern cultural society, also appearing to leisure activities. That's why I was curious about this phenomina in terms of geographical perspectives. If one place has multiple function at a same time, is there any conflict by coinciding each other? And are they able to coexist together for a long-term periods? From this curiosity, I can summarize my research questions as follows; - Who are main(important) actors? How about their relations, attitudes? - Why does conflict occur? What would be the result of conflict? - how is the process of conflict going on? Is there any negotiation process? - If not, what's the main reason? By exploring this matters,This research may trace this phenomena not just by agreeing this popular trends, but by investigating it academically. Besides, this research can contribute to them who are in charge of, and have difficulty in improving policies concerning urban leisure spaces. Why selected this case(Jongro-gu,Seoul)? Because it's One of most aggressive tourism policies among municipalities in South Korea. A good, famous, successful example relatively. Decent amount of time in administrating policy(since 2009), so stabilized. A lot of attentions from media about conflict between residents and tourists. Nevertheless, few studies about these sites. (1: visitors, 2: residents(pro), 3: residents(con), 4: public sectors) To figure out the fact about 4 relationships, 4 factors, from this figure, I planned to have a 4 qualitative research methods. - By performing an archival analysis through legal documents, reports published from Jongro-gu, I'm expecting to get information about whether there is communications or not between 2,3 before and during performing policy. - By doing landscape analysis It can clarify an different perceptions between 1,2 using mental map, and morphological access. - By doing participation observation at tour-guide program and neighborhood meeting twice each other, I can find some opinions between 3,4. especially I'll take part in 2 groups, one is at field tour program to observe 1, another is at education program to observe 3. -After all done, and analysing, I'll get in touch with interviewees consisting of 3 persons at twice each other. first time I'm considering this occasion as a period of making rapports by asking unstructured questions. second time I'll arrange semi-structured inteview materials to get more detail thoughts of them.



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# The transformation and development of a sustainable tourism system in the guest house region in Iwai Beach, Minami-Boso City, Chiba Prefecture, Tokyo Metropolitan Suburb

*Kei OTA (Japan)*

1. Research Background and Study Area This study analyzes a sustainable tourism system in the coastal area of Iwai Beach, Minami-Boso City. In Japan, most coastal resort areas are located near the metropolis of Tokyo. In Boso Peninsula, Chiba Prefecture, for example, many such accommodations are located along the eastern coastline. Iwai Beach is the largest concentrated region of guest houses in Boso Peninsula, positioning Chiba Prefecture (which is 100 km from Tokyo) as a metropolitan suburb. This research clarifies the transformation of the guest house region as well as the development of a sustainable tourism system in Iwai Beach, which was developed before WWII as a coastal beach resort. The number of beachgoers reached its peak in the 1960s and has decreased in recent years since the opening of the Tokyo Bay Aqua-Line Expressway in 1997. 2. Sustainable Tourism System in Iwai Beach The guest houses in Iwai Beach have dealt with the decreasing number of beachgoers through the following two strategies. First, they have tried to attract school excursion tourists by converting Iwai Beach guest houses into large-group accommodations. This strategy has been successful in attracting young tourists to the guest houses in Iwai Beach since the renovations. Second, the employment of local farmers and surplus workers at the guest houses has helped to sustain the busy season of summer. These guest house management strategies have contributed to the sustainable tourism system in Iwai Beach.



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## Destination approach in Barguzinsky Nature Biosphere Preserve

*Natalia LUZHKOVA, Anastasia MYADZELETS (Russian Federation)*

Barguzinsky nature biosphere reserve and the national system of nature protection in Russia in general celebrate their centennial anniversary in 2016. The system has evolved from species recruitment for hunting purposes to total wilderness preservation. The current trend promotes ecotourism development within all categories of federal protected areas. The administration of Barguzinsky nature biosphere reserve is challenged to make careful decisions balancing traditional conservation and tourist opportunities. The territory is divided into the core with strict limitations and biosphere proving ground where recreation is encouraged. However the highest tourist demand is pointed to the core due to better logistics and infrastructure of attractive sites. A possible solution is to provide multi-day tours in the vicinity of Davsha settlement. It is located on the shore of Lake Baikal in the center of the reserve. It used to be a village of 130 citizens with the headquarters of Barguzinsky as the town-forming organization for nearly 50 years. Davsha lands have been extracted from the core for managerial needs including an airport, hay-meadows and various depots. During 1990s most of the facilities were abandoned due to the headquarters relocation and lack of financing. To prolong tourist stay, Davsha has to become a complex destination with comfortable infrastructure including hotspring baths, museums and trails. New trail constructions should be based on the multidisciplinary approach protecting fragile ecosystems. Our research demonstrates scientific assessment of natural components and engineering opportunities, mapping and further monitoring of infrastructure, which can be spread to other protected areas.



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**Tourism And Natural Heritage Landscape Of A Ribeira Sacra (Galicia-Spain)**

Ángel CARBALLADA (Spain)

Tourism and environment are two issues that have been studied from different points of view, economists and naturalists, as well as different territorial levels. So in this paper, and shows another example of the economic importance that tourism generates in a territory with significance from the point of view of its natural characteristics, shows how important it is to identify and catalog the heritage of that natural landscape and link to tourism.



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## Forecasts and tourism activity cycles

*Anna ALEKSANDROVA (Russian Federation)*

Tourism development is subjected to cyclic fluctuations. The study of oscillatory processes in tourism help to forecast tourism activity and to give methods for managing tourism as an intersectoral complex on meso- and macro levels. The study is based on four initial positions of economic cycles theory: 1) the object of study is an oscillation as a whole but not its individual phases; 2) economic dynamics is polycyclic and represents a synthesis of waves with different periods, amplitudes and oscillation mechanisms; 3) cyclical fluctuations arise from equilibrium position - down on the recession phase and up during the improvement; 4) cyclical fluctuations take place independently from long-term economic growth: oscillating and translational movements are gradually more recognized as equally fundamental. Cyclical fluctuations in world tourism can be traced in the postwar period. They are described by statistical methods - equalization of statistical series on the basis of Fourier analytical formula. The number of international tourist arrivals is selected to be the key dynamic criterion as the most aggregate indicator of international tourism growth. World tourism structure is always in the oscillatory mode. Using the spectral analysis method the cyclic process in international tourism has been decomposed into completely separate oscillations with periods of 2-5, 6-11 and 13-20 years, which are closely interacting, intertwining and overlapping each other. Cycles of tourism conjuncture are also connected with long Kondratiev waves. Cyclical fluctuations in international tourism have spatial and temporal organization where one can distinguish centers of impulse localization, periphery of oscillatory processes and certain periodicity in impulse occurrence.



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## Scientific and methodological foundations for investment projects expertise in tourism and recreation

*Nataliya SHABALINA (Russian Federation)*

With the adoption of Federal Target Program "Development of domestic tourism in the Russian Federation (2011-2018)" the question of investment projects in tourism and recreation areas has emerged. Regional and municipal tourism and recreation clusters in Russia are now projected; they can get funding on the basis of public-private partnership. In this case there is an imperative need to apply compulsory procedure of tourism and recreation expertise for evaluation of tourism projects effectiveness. Tourism and recreation expertise is recognized as a comprehensive study assessing the compliance of regional tourism and recreational properties, facilities and development projects with the legal and other regulatory requirements for tourism and recreation sustainable growth. Examination of investment projects in tourism and recreation show that: • tourism and recreation expertise consists of several types of assessments; • in course of tourism and recreation expertise the impact of the project on 3 main spheres - the environment, society and tourism industry – is evaluated; • certain procedures and assessments as parts of tourism and recreation expertise are not corresponding and interdependent and can be carried out individually; • coordination of individual parts in tourism and recreation expertise is not essential, but its effectiveness increases when their execution is supervised by governmental structures in tourism industry. Only combined actions of the professional community and public authorities can solve the main task of tourism and recreation expertise - to improve the efficiency of budget spending for tourism and recreation clusters.



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## Les problèmes de la planification et d'organisation de tourisme médical et de la santé en Russie

*M.MOTOVILOVA (Russian Federation)*

Le tourisme médical et de la santé est un segment important de l'activité touristique. Comme un secteur autonome de l'activité touristique, il a un grand potentiel, offre une grande opportunité d'investissement. Analyse de l'état de santé de la population peut être considérée comme une partie de la recherche en marketing dans le domaine du tourisme médical et du tourisme de santé, visant à définir la stratégie de développement des activités des sanatoriums et des centres de santé. La comparaison des données statistiques sur de morbidité de la population des regions de la Fédération de Russie et du nombre des sanatoriums et des centres de de bien-être montre de grandes disparités dans les besoins et les possibilités de la population dans le traitement et la réadaptation. . L'analyse statistique montre la répartition inégale des sanatoriums et des centres de santé par région, rien à voir avec les besoins de traitement et de réadaptation de la population. Une grande partie des régions est caractérisée par le degré insuffisant de développement du tourisme de santé, malgré la présence de ressources naturelles variées. La lacune du tourisme de santé est un manque de l'organisation des services médicaux sous la forme d'un paquet complet, ce qui limite la capacité des agences touristique dans la vente de voyages spécialisés. La comparaison des prix dans les recours russes montre qu'ils dependent de niveau de confort, du degré de développement de la base matérielle, du prestige de la station, de différents coûts d'entretien des stations situées dans les différentes régions. La tâche la plus importante est la création de l'industrie du tourism de santé moderne, très efficace et compétitif pour répondre aux besoins non seulement des russes, mais aussi des étrangers.



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**Investigation of anthropogenic load on ecosystems: hiking tourism development as the case study**

*Anastasia MYADZELETS, Natalia LUZHKOVA (Russian Federation)*

Tourist flow effects on steppe and mountain-taiga forest ecosystems of the Sarma river trail are investigated. The case study territory is located in intensive hiking area of the Primorskii Range by the shore of Lake Baikal. Generated by recreational use, anthropogenic disturbance and stability potential of local ecosystems are considered in the river canyon and surrounding bays of the lake. Focused attention is paid to arid steppe ecosystems, which are highly-sensitive and low-resistant to external actions. During the last decade small bays have been developed rapidly into tourist destinations here. They are characterized by cabin-type accommodations, hiking along the Sarma river and on unestablished routes in summertime. Fieldwork included comprehensive description of the route, drawing of the trail profile, characterization of ecosystem components (relief, vegetation, soil horizons) on key plots, evaluation of anthropogenic impact and disturbance degree on spots with strong recreational use. Soil and vegetation types were defined and mapped; their resistance to external influence was assessed. For the analysis of local anthropogenic load trail conditions and infrastructure elements (bridges, camp-sites, fire places, etc.) were evaluated. Permanent use of the trail lead to soil overpacking, reduction of water-air and biological regime, increase of runoff and soil erosion. Campsites along the trail were the most affected areas. They were characterized by high disturbance, total disappearance of vegetation and fertile soil layer. The integrated map of ecosystem resistance was created. The results of work are used for improvement of the existent path and constructions of new ecotrails in the Primorskii Range.



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## System of tourism and recreation clusters as a basis for tourism development in Russia

*Victor KRUZHALIN, Kirill KRUZHALIN (Russian Federation)*

Tourism and recreation cluster (TRC) is a group of geographically adjoining and interacting companies, scientific, educational and public institutions allied with state administrative bodies that form and provide tourist flows using tourism resources of the territory. There are TRC of different levels: municipal, inter-municipal, regional, interregional, federal and cross-border (international). Clusters of different levels form an integrated system, providing the needs of people in recreation and tourism. Clustering is determined by the following reasons: 1. particular innovative environment improving the competitiveness of the territory is generated within a cluster; 2. risk level is reduced and tourism product quality is increased owing to the effect of synergy; 3. well-balanced and sustainable growth of the territory and its residents employment are provided; 4. TRC contributes to the adjoining industries progress within the region. TRC is an effective tool for tourism and recreation growth supported by public-private partnership (PPP). PPP is a system of effective interaction between administrative institutions of different levels and business in order to implement projects of public importance and programs of regional socio-economic development aimed at improving its life quality. This model is currently being implemented in the Federal Target Program "Development of Domestic and Inbound Tourism in the Russian Federation (2011-2018)". Scientific and HR support play the major role in high-quality construction of TRCs. At present, more than 700 higher educational institutions offer professional training and retraining of personnel for tourism development in Russia. Its further development is linked with tourism safety system worked out together with the EMERCOM of Russia.



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## Features of knowledge of the native land on the basis of implementation of excursion and tourist educational and informative projects

*Natalia KUZNETSOVA, Victor KRUZHALIN (Russian Federation)*

In many countries of the world acquaintance of pupils of educational institutions with their country is the part of the state program. For example in Israel during school vacation over all country it is possible to meet groups of the children dressed in one colored t-shirts. It testifies that children participate in the excursion devoted to studying history, geography, and culture of their country. Until later the organization of such excursions and tourist trips in Russia was problematic that was connected with legislative restrictions on transport movement of children. Modern realities introduce the amendments and offer new opportunities for today's school pupils. The Department of recreational geography and tourism of Lomonosov Moscow University has developed the project "Know the Small Homeland" urged to unite all existing information, tourist, psychology and pedagogical technologies in modern educational institutions. This project coordinates the cycle of the subjects studied by school pupils with the system of excursions to forest, greenhouse, firm, production plant, etc. Leaving their schools children and teenagers can study biological, ecological, social or technological processes in real life, and even independently conduct researches, creating own projects in any subject of the school program and exchange their results on the educational Internet portal which is specially created for this purpose. Approbation of this project has already carried out in 2014-2015 academic school year at schools of the Stupino district of the Moscow region. The result was the provement of efficiency of such type of educational activity because children's participation in this project extends their ideas of the world, fills this picture with new sense, motivates for further training and helps to find the calling in all the variety of school subjects and sciences. This project has received support in many regions of the country; it can become the effective tool for knowledge of the homeland and disclosing creative abilities of school pupils.



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## Tourist Maps And Modern Gadgets As An Info Factor Of Mobility In Tourism

*Marina MOTOVILOVA, Valeriy BAYURA (Russian Federation)*

Tourism activities require modern mapping and informational support. Development of a global navigation satellite system, the use of satellite images, the improvement of tourist GIS, first of all, with the use of mobile devices, the elaboration of new tourist e-maps bound up with continuously upgraded databases, helps the development of mass individual tourism (in contrast to most developed in the twentieth century mass group tourism). Modern trends are such that the traditional paper tourist maps use basically as an information and promotional material, conducing to the initial formation of attractive tourist image of the territory. The undoubted advantage of traditional paper maps is independence from the power supply, the availability and stability of the internet, which is especially important when traveling in hard to get areas. The great advantages of Internet maps are the use of to-date information (often in the mode of on-line), possibilities of virtually quick moving in the world. The development of new mapping and information technology in the tourist industry leads in some cases also to change the list of required staff skills and abilities. International hotel chains have often employees with knowledge of information technology – "compcierges", whose official duties include providing information and technical support to tourists. The current stage of development of the tourism has led to the new requirements for the information content of tourist maps, developing of multimedia-atlases and Internet maps for mobile devices. Integrated use of satellite receivers and GIS allows control the safety of tourists, and optimize the tourist routes. However, the traditional (paper) tourist maps and atlases are still widely used and will be in demand in tourism.



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## Geo-Ecological Assessment On Tourism And Recreational Capacity In Mongolia

*Tsogbadral KURELBAATAR, Amgalan AVKINSUKH, Khadbaatar SANDAG, Bat-Erdene TSEDEV, Ser-Od TSEDEVDORJ (Mongolia)*

Tourism is developing as a priority sector with a great potential to contribute to socio-economic development of Mongolia and the pristine nature and nomadic culture and life are main exhibitions for tourists. In the region in which tourism is developing, doing recreational and geo-ecological research plays a significant role to plan tourism environmentally friendly, to protect animals' habitat, to farm nomadic and traditional cattle, to maintain the pristine nature, and to decide properly the ecological problems. This presentation intended to study on six soums region of Dornod province which are included in ''Mongol-Daguur" Ecoregion that is one of Global 200 list as a target area. In addition, this area keeps inimitable feather-grass steppe landscape type in the eastern part of Mongolia, includes over 50 historical values and sightseeings that was left for the World War-II afterlights, shows nomadic civilization and multinational life and is the birthplace of migratory birds which was written on the International Red Book of endangered species. While we have executed tourism-recreational capacity, the approach used qualitative and quantitative assessment methods and then this eco-region was determined that is ''suitable" for the best tourism-recreational mode, ''pollution is relatively less" for ecological condition, and there is no unbalance of ecosystem. Also, the image of tourism-recreational capacity regionalism is drawn by scale 1:1000000.



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# C12.16 Geoparks

## Geoparks and Geoheritage 1

**Chairperson(s):** *Dongying WEI*

- Development Trend of Geoparks and Discussion on Several Related Questions

  *Dongying WEI (China)*

- A New Geopark Suggestion; Sille (Konya), Central Turkey

  *Kerim KOCAK (Turkey)*

- A chance for European and Global Geopark: the coastland of Cilento, Vallo di Diano and Alburni National Park (southern Italy)

  *Valente ALESSIO, Aloia ANIELLO, Guida DOMENICO (*Italy*)*

- Transboundary geoparks for what and to whom?: Case of a cross-national geopark in Hungary and Slovakia including comparisons with Japan

  *Daichi KOHMOTO (Japan)*

- Construction of the Geo-story Incorporating Sake Brewing Industries in the Geopark: A Case Study of Itoigawa Geopark, Central Japan

  *Suguru SAKAGUCHI, Ryo IIZUKA, Toshio KIKUCHI (*Japan*)*

## Geoparks and Geoheritage 2

**Chairperson(s):** *Wei DONGYING*

- A Suggested Training Area For Geopark And Geotourism In Example Of Kazdağlari (Ida Mountains)

  Kamile GÜLÜM (Turkey)

- Protected Landscapes in Moscow

  Svetlana SAMSONOVA *(Russian Federation)*

- The scientific and educational value of non-karst caves in a new Geopark project "Wisłok Valley – The Polish Texas" (the Polish Outer Carpathians)

  Michał ZATORSKI *(Russian Federation)*

- Long History of Nomination of the Area «Belogradchik Rocks» (Bulgaria) for the European Network of Geoparks

  *N.N.KALUTSKOVA (Russian Federation), D.SINNYOVSKY (Bulgaria), A.A.MANZHETOVA (Russian Federation)*

**POSTER EXIBITION**

- The red book of soil in lanscape protected area

  *Anton ROBERT, Amir GUSEYNOV (Russian Federation)*



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## Development Trend of Geoparks and Discussion on Several Related Questions

*Dongying WEI (China)*

In order to protect the geological heritage, the Division of Earth Sciences of UNESCO presented a new concept named UNESCO's "Geoparks Program" to the governing bodies of the organization and the program has been discussed since 1999 and came to its final conclusion in June 2001. The program achieved the full international recognition, and secured their effective political impact, especially from European Union, China and International Geographical Union(IGU) . China is one of the countries which established Geoparks at the earliest stage, and 182 national Geoparks have been established till now, and 24 of them are the members of Global Geopark Network (GGN), and the establishment of the Geoparks made a lot of contribution for the sustainable development of local society and economy. The article introduces the Global Geopark Network (GGN), European Geopark Network(EGN), Commission on Geoparks of International Geographical Union(IGU-CoG) and the status quo of Chinese Geoparks. Connotation of Geopark is explained and the Chinese translation of Geopark is discussed and new translation is suggested by some geographers. Geographers have made a lot of contribution for the development of Geoparks, especially the establishment of Commission on Geoparks of International Geographical Union. The geographers can make more contribution in the future for Geoparks in the following fields. 1. Sustainable development of Geoparks; 2. Environment interpretation and education in Geoparks; 3. Relationship of protection and development for Geoparks; 4. Management and related policy studies for Geoparks.



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## A New Geopark Suggestion; Sille (Konya), Central Turkey

*Kerim KOCAK (Turkey)*

The study area is located to the NW of Konya, in where Silurian-Cretaceous basement rocks (marine sediments), Upper Miocene–Pliocene lacustrine, fluvial deposits and Sille volcanics and Quaternary deposits, outcrop. The basement rocks were overlied unconformably by lacustrine deposits, which composed of alternation of mudstone, claystone, sandstone and stromatolitic and oncoidal limestone. Towards top, calcareous deposits, with sandstone and rock fragments, were found as alternation with tuffaceous unit. Lava dome and flow from Sille volcanics, the oldest volcanic units (11.45 to 11.9 Ma ) in Konya region, overlied fluvial sediments. Existence of stromatolites in the limestone indicates a lacustrine depositinal environment, which has 10-15 m of depth, and salinity up to 7%. There is excellent exposure in the field, which let us to observe stromatolites and oncolithes; so many volcanic, sedimentary and volcanosedimentary units; sedimentary structures (e.g. bedding, graded bedding, load casts) and tectonic structures (e.g. fault, synsedimentary saults, folding). Sille is rich not only for its geological occurence, but also for its culture and history, with having four churches in the area that belongs to Christian architecture, and Ottoman Era mosques which is of importance in the sense of Turkish Islamic Art. All of which suggest that Sille area can be a candidate for Geopark.



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## A chance for European and Global Geopark: the coastland of Cilento, Vallo di Diano and Alburni National Park (southern Italy)

*Valente ALESSIO, Aloia ANIELLO, Guida DOMENICO (Italy)*

Cilento, Vallo di Diano and Alburni National Park (southern Italy), member of European and Global Geopark Network, has one of the most fascinating and appreciated coastlands in the Mediterranean. Its outline is very complex with long, rectilinear coastal plains, pocket beaches, prolonged headland and sharp cliffs. Small islands and little stacks are also present near-shore and off-shore. Such geomorphological features, usually mantled by Mediterranean vegetation, are frequently well integrated with archaeological traces and historical structures, which makes it a unique landscape. However, in the last decades its attractiveness has led to a growing occupation of the coast with civil settlements and tourism infrastructures, so as to become an important socio-economic factor in the Geopark. This resulted in hazards for people, damages to habitats and losses for the landscape heritage. In order to address innovative approaches for best conservation practices and sustainable use of this zone a new classification scheme, which improve the comprehension of the mid-to long term evolution of the coast, is proposed. Moreover, in order to create environmental awareness in the population and to develop compatible forms of integrated tourism a suggestive trail along the coast with a boat is proposed. This trail permit to focus, not only a great number of geosites and geomorphosites, but also peculiar aspects of this coast, such as many coastal caves which hosted prehistoric inhabitants since the Middle Paleolithic, the ancient site of Velia with several ruins, in which were the seat of the pre-Socratic philosophical school founded by Parmenides and Zeno, underwater environments where live a wide variety of organisms and the places where the Mediterranean diet was instituted.



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**Transboundary geoparks for what and to whom?: Case of a cross-national geopark in Hungary and Slovakia including comparisons with Japan**

*Daichi KOHMOTO (Japan)*

The number of transboundary geoparks are increasing worldwide. Many geoparks have plural number of municipalities, although management is easier in geoparks with single municipality. Some geoparks even have national borders. The aim of this study is to clarify how a geopark with a national border is managed, and to examine the meaning of the territoriality. A case study was conducted in Novohrad - Nógrád Global Geopark (NNG) with a national border between Hungary and Slovakia with some comparisons with geoparks in Japan.



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## Construction of the Geo-story Incorporating Sake Brewing Industries in the Geopark: A Case Study of Itoigawa Geopark, Central Japan

*Suguru SAKAGUCHI, Ryo IIZUKA, Toshio KIKUCHI (Japan)*

Geoparks are topological and geological formations that are protected and utilized at the same time. In Japan, there are 36 Geoparks, and 7 of them are Global Geoparks. Geo-stories can be viewed as a combination of three features - firstly the geological formation of the Geopark; secondly the ecological resources found in the park, and lastly the historical and cultural background that arose from these natural resources. In this case study of Itoigawa Geopark in Niigata prefecture, we discuss the prospects of incorporating the brewing industry into a Geo-story, through the use of local cultural and natural resources. There are few Geo-stories in Itoigawa Geopark that incorporate topology, geology and cultural resources into the origin and formation of local industries. Water is an important ingredient in the brewing industry. Since water is a natural resource and an essential part of the local culture and industry, using water in the Geo-story is one of the ways to reflect the environment of this region.



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# A Suggested Training Area For Geopark And Geotourism In Example Of Kazdağlari (Ida Mountains)

*Kamile* GÜLÜM (Turkey)

The aim of this study is determined the potential of Mount Ida (Kazdağları) in order to use geopark and geotourism education. Ida Mountains is a unique world heritage because of easy transportation facilities, geological and geomorphological formations, coastlines, water resources, climate, vegetation, historical, cultural and myhthologic richness. Especially, They have all combination of geopark that necessary for nature education.Thus Ida Mountains is quite suitable for geopark education. When the nature education center, monitoring of routes, walkways and watching points is established, It can be started geopark and geoturizm education at all levels from pre-school to the University. Ida mountains (Kazdağları)' source values are suitable for this education. Thus, the region may have a special place not only for tourism but also as nature education center in the world. In addition region people are developed.



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## Protected Landscapes in Moscow

*Svetlana SAMSONOVA (Russian Federation)*

Today there are 19 protected areas in Moscow and the majority of them, as well as the network of protected landscapes as a coherent whole, remain unexplored in terms of its biodiversity, geomorphology, ecosystem functioning and the perspectives in highly urbanised environment. Much of protected areas in Moscow is at risk from air, soil and water pollution and construction development nowadays. In this study the position of protected areas in landscape and land use structure of Moscow city have been investigated. To examine the current state of the protected areas network the following parameters for each unit were evaluated: area, landform, exogenous processes, surrounding land use, drainage basin position, position in relation to prevailing winds. Based on combinations of these criteria several classifications of protected areas were offered. Only 6 out of 19 protected areas in Moscow are classified as stable, while 2 nature reserves are unstable and are at risk of extinction. On the basis of proposed classifications, guidelines for local authorities have been developed. The research findings and results can be used for spatial planning by policy makers, with the focus on the newly established Moscow territories (after 2012 city expansion) where new parks with a protected status will be organized.



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## The scientific and educational value of non-karst caves in a new Geopark project "Wisłok Valley – The Polish Texas" (the Polish Outer Carpathians)

*Michał ZATORSKI (Russian Federation)*

Most of the caves in the Polish Carpathians are associated with slope processes. The first studies on the origin of these objects were made still in the 1970s and 1980s. They indicated a relationship with gravity mass movements. Currently, the research and observations of caves performed in the Polish Outer Carpathians allow to recognize the type of mass movement and help characterize the stages of deep rock landslides development. Caves, which are an initial stage of landslide scarp development, allowed to distinguish two planes of the rock landslides development, i.e. cutting surfaces and the shearing zone (Margielewski, Urban 2000; Margielewski 2001). Owing to the diversity of caves (both geomechanical and morphogenetic), a new division of these objects was adopted (Urban, Margielewski 2013). According to the morphogenetic criterion, initial caves, subsequent caves, „intermediate" caves and multiphase caves, formed during several stages of development, were distinguished, whereas according to the geomechanical one, dilational caves, dilatancy caves and boulder caves (among colluvium and movement rock boulders) were singled out. Additionally, complex caves, corresponding to multi-phase caves, can be distinguished. Besides the caves whose origin is associated with mass movements, those conditioned by erosion processes and weathering can be also distinguished. The insufficient use of geodiversity in the Polish conservation system induces the search for new areas of high scientific and educational value. Therefore, there is a need to create geoparks, whose role is not only to protect valuable scientific geosites, but above all to educate. Taking into account the current range of knowledge, the caves located in the middle part of the Beskid Niski mountains, in the area of a new Geopark project "Wisłok Valley – The Polish Texas", are especially predisposed to this type of protection. It is one of the largest concentrations of caves in the Polish Carpathians, and the morphogenetic variety of cave objects in this area encourages to describe their scientific and educational roles.



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## Long Experience of Nomination of the Area «Belogradchik Rocks» (Bulgaria) for European Network of Geoparks

*A.A. MANZHETOVA, D. SINNYOVSKY, Natalia KALUTSKOVA (Russian Federation)*

In 2007 for the first time a package of nomination papers were sent to UNESCO Geopark commission. The nomination was not supported because of too small territory proposed for geopark and uncertainties of administrative body. The territory was expanded by factor ten due to inclusion of famous karst cave «Mogura» located to the north of Belogradchik Rocks. Despite of the expansion park was still located within only one community (Belogradchik). In 2011, the Belogradchik rocks have applied for membership in the European Network of Geoparks once more. One of the reasons that they were not accepted that time was the lack of linkage between the cultural and natural heritage of the region. Under the just-completed project (2014) of the National Science Fund entitled "Scientific development of a new category of protected area in Bulgaria - National Geopark on the example of the "Belogradchik rocks" was created massive database about the geotopes of scientific and aesthetic value, and Museum collection of rock and fossil samples for the newly-built visitor center in the town of Belogradchik. In this project the territory of the proposed park was expanded for 4 communities according to the latest recommendation of UNESCO experts. The most serious problem for nomination is still system of management of the park.



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## The red book of soil in lanscape protected area

Anton ROBERT, Amir GUSEYNOV (Russian Federation)

The protection and preservation of soil – center could give a reliable guarantee of saving all the rest, in particular «The Red Book» of plants, mushrooms and animals. This means that first of all we need to create The Red Book of soil that will serve not only for protection of soil itself but at the same time will fill the conception of SPNR with a new content. «Tepliy Stan» landscape protected area was chosen as a model for the research. It is located in the south-west of Moscow in mixed forest and it suffers from an intensive recreational influence in all the seasons. Preservation of soil as special nonliving material that characterizes soil variety as a carrier of biological variety, as «memory» of landscape and human culture history and as objects for monitoring – is the foundation to include soil into the Red Book. The Red Book contains main recommendations for protecting sod-podzolic soils of landscape protected area «Tepliy Stan». The offered security arrangement includes: • soil protection from different kinds of mechanic influence leading to natural texture of soil damage, thickening, water erosion, soil texture destruction and loss of black-mould humus; • preservation or rehabilitation of soil forming factors as the condition for preservation of this soil type (recovery of mixed forest); • protection from chemical and biological pollution; • limitation of constructing works at landscape protection areas; • optimization of recreational influence; • preparation of special informative stands in order to increase ecological culture of recreants.



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# C12.17 Global Change and Human Mobility (Globility)

**People on the move: the persective of the life cycle and the role of gender**

**Chairperson(s):** *Barbara STANISCIA, Josefina DOMINGUEZ-MUJICA*

- Youth mobility, job opportunities, marginal areas
  Armando MONTANARI, Barbara STANISCIA (Italy)
- The Spanish tourism destinations and the labour life courses of migrants
  *Juan PARRENO-CASTELLANO, Josefina DOMÍNGUEZ-MUJICA, Ramón DÍAZ-HERNÁNDEZ (Spain)*
- International Gap Year Migration – Motives, Characteristics And Problems Of German Adolescents
  *Manuela BAUER (Germany)*
- Distance and intensity of international socio-economic interactions
  *Alexander FETISOV (Russian Federation)*

**Real and virtual borders: the challenge of human mobility**

**Chairperson(s):** *Barbara STANISCIA, Josefina DOMINGUEZ-MUJICA*

- Beyond the migration policies: understanding the emigration of young-skilled Spaniards in the context of economic and financial crisis
  *Josefina DOMÍNGUEZ-MUJICA, Ramón DÍAZ-HERNÁNDEZ, Juan PARRENO-CASTELLANO (Spain)*
- Emigration of Russian Germans to Germany and transnational links with Russia
  *Maria SAVOSKUL (Russian Federation)*
- Core-periphery model in transborder connections in the Russian-Belorussian borderland
  *Kira MORACHEVSKAIA (Russian Federation)*
- The hierarchy of workers, according to nationality, in the labor market of the Sultanate of Oman - A socio-geographical analysis
  *Montasser ABDELGHANI (Oman)*
- Local border traffic as a factor in the formation of the Russian-Polish cross-border region
  *Oleg BOLICHEV, Ivan GUMENIUK (Russian Federation)*

**Responses to displacement from Asia Pacific**

**Chairperson(s):** *Jane SINGER, Susanna PRICE*



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- Negotiated Settlements, Voluntarism and Asymmetries in Development Forced Displacements

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  *Brooke WILMSEN (Australia)*

- Pondering the right to return… and the right not to: Fukushima evacuees in limbo

  *Jane SINGER, Winifred BIRD (Japan)*

## POSTER EXIBITION

**People on the move: the persective of the life cycle and the role of gender**

- La différenciation territoriale de la population sur le marché du travail de la Tchouvachie à l'aspect gender

  *Ekaterina ZHITOVA, Natalia KARAGANOVA, Anna GUMENYUK (Russian Federation)*

- Decomposition of Mortality Among two major religion In India: Extricate the Muslim Mortality paradox

  *Pushpendra SINGH (india)*

**Real and virtual borders: the challenge of human mobility**

- The resilience of human mobility facing natural hazards. The volcanic eruptions in Ilha do Fogo (Cape Verde)

  *Claudio MORENO-MEDINA, Agustín NARANJO-CIGALA, Ezequiel Guerra de la TORRE, Alexandre NEVSKY, Herculano DINIS, Joao ANDRADE (Spain)*



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## Youth mobility, job opportunities, marginal areas

Armando MONTANARI, Barbara STANISCIA (Italy)

Youth migration has become a crucial issue for Mediterranean European countries in a time when a severe economic crisis, with different degrees of intensity, is affecting their territories and regions. If, on the one hand, youth mobility offers opportunities to individuals (personal, educational and professional growth, job and career opportunities, chance to improve quality of life) and it is promoted by several EU policies and initiatives, on the other, it is threatening the future of European marginal regions. When youth mobility, indeed, is unidirectional (i.e. young indigenous people leaving peripheral areas are not replaced by young people coming from other regions) and is not temporary, it poses an important problem in terms of regional imbalances and the need for regional re-equilibrium. This paper aims at reviewing the recent literature concerning the spatial effects of youth mobility. Focus will be on recent experiences of some Italian central and peripheral regions.



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## The Spanish tourism destinations and the labour life courses of migrants

Juan PARRENO-CASTELLANO, Josefina DOMÍNGUEZ-MUJICA, Ramón DÍAZ-HERNÁNDEZ (Spain)

The increase of residential areas in the coastal tourist destinations in Spain maintains a close relationship with the international lifestyle migration and the lessening of the benefits in the tourism market. While not denying this, the amount of old foreigners in these spaces is linked to the nature of the tourism in Spain. This is characterized by the arrival of workforce from the North and Central Europe since the sixties. Many of these workers arrived to Spain in order to stay for a short period of time, but an important number remain after retirement. Therefore, we might consider that a significant part of the old foreign people living in a permanent or temporary way in the Spanish coastal destinations were labor migrants that decided not to abandon the initial host areas. This work focuses on a better understanding of this process. By using several sources, we aim at getting deeper into the quantitative dimension of this phenomenon, exploring the characteristics of this group of migrants and assessing the causes that can explain their arrival and permanence.



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## International Gap Year Migration – Motives, Characteristics And Problems Of German Adolescents

Manuela BAUER (Germany)

This presentation focuses on international mobility of German adolescents. The gap year market includes Au-Pair, International Volunteering and Work & Travel stays abroad. It is a growing market segment in international tourism. For example, in Germany the number of adolescents doing International Volunteering meets a sudden increase from 4,632 participants in 2007 to 6,014 participants in 2008 because the German government established "weltwärts", public funding for international voluntary services in 2008 (AKLHÜ 2012). This presentation aims at providing a broad insight into the German gap year industry, examining the motives, characteristics and problems of the young people going abroad. For this purpose a double-stage online-based survey of young Germans is conducted before and during their stay abroad. Using statistical methods various types of gap year participants are identified and differences between the groups are examined. The influence of age, gender, nationality, education, attitude and behavior is discussed in matters of travel motivation and problems occurring. The findings indicate that there is a difference in the gap year migration behavior of young women and men. Theoretical contribution of the study is not only a characterization of the target group, but also a scientific contribution to geographical life cycle research in questions of adolescent behavior and role of gender.



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## Distance and intensity of international socio-economic interactions

Alexander FETISOV (Russian Federation)

It was assumed that universal and free access to modern communication system would lead to decentralization of the settlement and economy. In reality this has not happened or occurs very slowly. That is, distance remains to be an important determinant of the intensity and direction of socio-economic relations. The importance of spatial proximity is particularly evident in the intensity and scope of the neighborhood interactions, which are discussed on trade in goods and services, labor migration, tourist trips and telephone connections data. International trade in goods and services continues to be characterized by a high concentration within a small group of participants. More than a quarter of world commodity exports takes place between 20 pairs of counterparts. What is more, 14 of the 20 largest international trade flows link neighboring countries, and 9 of the 25 largest mutual flows of trade in services were accounted for neighboring countries. Exactly half of 122 tourist flows exceeding 1 million people each are generated by neighboring countries. Distance is included as a key variable in all models of migration mobility. In the area of international migration adjacency further underlines the importance of geographical proximity. The importance of short-distance interactions is indirectly confirmed by the structure of international telephone connections. Thus, very high intensity of socio-economic interactions between neighboring countries retains its value in the context of globalization.



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## Beyond the migration policies: understanding the emigration of young-skilled Spaniards in the context of economic and financial crisis

Josefina DOMÍNGUEZ-MUJICA, Ramón DÍAZ-HERNÁNDEZ, Juan PARRENO-CASTELLANO (Spain)

Throughout history, emigration has prevailed against immigration in Spain. The historical emigration flows involved low skilled workers from rural areas who moved to developed nations demanding a cheap labour force for certain services, especially related to factories and construction. After the oil crash, and in parallel with the entry of Spain into the European Union (1986), the increase in the Spanish income level due to a process of economic modernization had important consequences in the behaviour of migratory balances. Spain changed its migratory profile, and it quickly became part of the group of European immigrant-receiving countries. But this situation changed impromptu in 2008. The impact of the economic and financial crisis in Spain impoverished the immigrants living in the country, and many of them returned to their home countries. At the same time, the young Spanish people with high-level studies started to struggle to get a proper job and many of them, up to the migration challenge, left Spain between 2008 and 2015. They have taken advantage of the recruitment campaigns developed by companies in certain countries, supported by state programs and labour market institutions. Other factors contributing to this new trend are (i) the benefits of a Community of Nations (the European Union) with free movement of goods, capital and labour force; (ii) the especial linkages forged by Spain and its former colonies; and (iii) the process of internationalization of Spanish companies. However, the largest trigger has been the capacity of young skilled Spaniards to consider every country as a potential migratory destination despite its restrictive visa policies. By doing so, they have overcome international borders and have contributed to forge new linkages between nations.



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## Emigration of Russian Germans to Germany and transnational links with Russia

Maria SAVOSKUL (Russian Federation)

Current research concentrates at studies of connection between ethnic identity of Russian Germans in Germany and type of their connection with Russia. Research has been held both in Russia (Altai, Omsk, Saratov oblast's) and in Germany (Erlangen, Nurnberg, Furth, Bielefeld, Detmold) covering more than 100 respondents interviewed in Germany and Russia. Most of questions, asked were focused on reasons of migrations, factors of Russian Germans adaptation in Germany, level of German languages knowledge, employment problems and differences in type of links with Russia or with Germany. Assuming by the way that during last 10 years these links have been subject of change. The result of the research allows to state that Russian Germans in Russia and in Germany do not form a homogeneous ethnic group. Apart of that the Russian Germans living in Germany can be formally dissipated between three groups of ethnic identity: "Real Germans", Russian Germans and "Russaki (Russacks)". These groups are significantly different in type and intensity of connections with their native country. All German Russian's links with their country of origin is of a different kind in comparison to those of other emigrants. They get emotional support from their friends and relatives in Russia as they provide various type of financial help in opposite direction. In case of Russian Germans studies the so-called "remittance approach" appears to be not full representative. The real volume of money help can not be evaluated by remittances since the majority of money transferring by Russian Germans to Russia are brought in cash. Nevertheless the real intensity of links can be estimated using telephone calls statistics using cheap calls services.



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## Core-periphery model in transborder connections in the Russian-Belorussian borderland

Kira MORACHEVSKAIA (Russian Federation)

Many populations that reside in border regions experience social benefits associated with the opportunities to buy goods, to study, and to work in the neighboring country. However, many districts of the Russian borderland with Belarus decrease in population and economy despite the existence of the Eurasian Economic Union. The population does not always utilize the positive opportunities of the frontier position. Transborder connections are not very intensive even near the border. The purpose of this study was to determine the role of central or peripheral position of the settlement/town in the intensity of transborder connections. We evaluated data obtained from expert interviews and sample surveys of the population from field research conducted in the 18 districts of the Russian-Belorussian border regions in 2009-2015. We found that the frequency of transborder trips of the border region populations depended on the level of their income and social mobility more than on the distance to the neighboring state from their place of residence. Our data showed that populations in the cores of the territory – regional capitals – more often travelled to neighboring districts. The population of the closest to the border setllements "gravitate" to the neighboring state more than to the own only in several cases – under the influence of historic reasons or because of the specific functions of transborder relations.



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# The hierarchy of workers, according to nationality, in the labor market of the Sultanate of Oman - A socio-geographical analysis

Montasser ABDELGHANI (Oman)

In the past few decades, some regions in the world have witnessed high immigration rates as a result of their economic need for a labor force or as a result of their population decrease which has led to a demographic imbalance and a deficiency in productive age groups. The Arab States of the Gulf represent one of the more attractive destinations for immigration since the 1950's, due to their urgent economic need for a workforce. In many countries which have immigrants, and where multiple ethnicities exist, the labor forces are distributed in a hierarchical way. So it should be noted, that certain work and economic sectors are in the hands of nationals, while others are in the hands of immigrants. Even within the immigrant groups, the hierarchy distribution of business may exist. This has been noted by the expatriates from certain countries working in a particular economic sector. Certainly there are a variety of reasons and circumstances leading to the organization of the labor market in this way between the national population on the one hand and migrant workers on the other hand, or among the migrant groups themselves. The current research paper discusses the issue of the hierarchy of workers in the labor market and in the economic activities in the Sultanate of Oman, and attempts to answer the following questions: Is there any kind of hierarchy of workers employed in the Sultanate of Oman, according to their nationality? In the sense, is the national population or immigrants associated with specific economic activities? In the case that this hierarchy exists, what are the conditions and factors that led to that?Has it changed over time? And why? Has the share of Omanis and expatriates from various nationalities in the economic activities changed? The data of the Omani census of 2003 and 2010 related to the distribution of the workers in the economic sectors will be analyzed. In addition to the data analysis, interviews will be conducted with some of Omani population in the governorate of Muscat to obtain the views of local society about the issue of hierarchy in the labor market.



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## Local border traffic as a factor in the formation of the Russian-Polish cross-border region

Oleg BOLICHEV, Ivan GUMENIUK (Russian Federation)

Agreement on local border traffic (LBT) between Poland and Russia, which entered into force on 27 July 2012, was hailed as a great success of international cooperation between the two countries. Many experts saw the prototype of the future agreement on visa-free space agreement between the European Union and the Russian Federation, which are periodically discussed in the framework of international dialogue. The results of two years of the agreement, LBT demonstrated its usefulness in the development of scientific and cultural contacts, active cooperation of local governments and non-governmental organizations between the Kaliningrad region and the border (Pomerania and Warmia and Mazury) province of Poland. In fact, the regime LBT strengthened existing vector of formation of the Russian-Polish cross-border region. If in 2011 the volume of mutual border crossings amounted to 2373.5 thousand man, then in 2013 he was made 6 188 thousand. People, of whom about 3,500 thousand has been made using the format LBT. In this mode, LBT different impact on the economic development of the border regions. So according to local experts as a result of LBT retailers in the region receives less than a year from 7 to 20% of total turnover, while in Poland LBT action on the contrary, stimulate the retail trade. In this case differ significantly and objectives of mutual trips. If Polish citizens mainly purchase gasoline, alcohol and tobacco products, the range of interests of the Kaliningrad region in Poland is more varied, and includes both the purchase of foodstuffs, as well as the acquisition of works and services (primarily tourism services as well as medical , educational, etc.). During the discussion of the possibility of introducing the regime of local border traffic, Polish experts feared increase in the volume of smuggling and increase the number of illegal immigrants in the country, which according to the admission of Polish experts did not happen. This fact may be an important argument in the course of further dialogue between Russia and the European Union in matters of mutual visa facilitation. The sharp depreciation of the ruble, which took place at the end of 2014, changed the situation. On the one hand there was a sharp reduction in the number of Russian citizens crossing the Russian-Polish border, and on the other led to a significant increase in the list of goods and services, which began to acquire Polish citizens coming to the Kaliningrad region. Assess the full extent of all the structural changes in the geography of the local border traffic will only be possible by mid-2015.



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## Negotiated Settlements, Voluntarism and Asymmetries in Development Forced Displacements

Susanna PRICE (Australia)

"Voluntary" land transfer agreements, negotiated directly between "willing buyers and willing sellers", present a seemingly empowering alternative to the use of legal instruments for land acquisition or transfer which entail forced displacement. Yet asymmetrical bargaining power between the negotiating parties can undermine the fairness of negotiated outcomes and the right of the sellers to a "no-displacement" option. Viewed against a complex background of bourgeoning land transfers in multiple sites, this paper examines rights-based and risks-based approaches to negotiated settlements, concluding that measures to address asymmetries in bargaining power must look beyond enhanced negotiation procedures to address underlying social and political dimensions. Is the balance achievable?



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## After the Deluge: The longitudinal impacts of the Three Gorges Dam on livelihoods

Brooke WILMSEN (Australia)

In 2015 the construction of the Three Gorges Dam on China's Yangtze River will officially end with the completion of the ship lift. For the more than 1.13 million people displaced for its construction, their livelihoods were punctured by dispossession and for the most part they were left to respond with limited state assistance beyond basic compensation. Over the last decade they have been busily rebuilding - using their various assets, resources and strategies to adjust to the altered environment. How well they have adjusted is not yet understood. To this end, this paper offers an analysis of five sustainable livelihood outcomes. Using panel data at three points in time (pre-resettlement, 2003 (post-resettlement) and 2011) livelihood outcomes are explored. It finds that following displacement (the 2003 cohort) the majority of resettlers were struggling to meet even their basic needs; but eight years, the gains have been substantial. This paper is the first publicly available longitudinal analysis of the project and the first indication that the resettlers are recovering from the upheaval of the world's largest dam.



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## Pondering the right to return… and the right not to: Fukushima evacuees in limbo

Jane SINGER, Winifred BIRD (Japan)

Nearly 160,000 residents of the areas contiguous to the destroyed Fukushima Dai-ichi nuclear plant that exploded shortly after the Great Eastern Japan Earthquake and Tsunami of March 11, 2011 continue to be displaced from their original communities, with many still living in temporary evacuee housing. Some of the displaced are not yet permitted to return to communities inside an official exclusion zone; others are being encouraged to return to areas that the government has declared to be habitable but are precluded from doing so due to lingering fears of radioactivity and a lack of employment opportunities. As part of an official regional revitalization and "normalization" policy, the national government promotes the rapid return of residents to "decontaminated" areas. This article explains the current status of Fukushima evacuees vis-à-vis official government resettlement policy and investigates the uncertainty and difficult decisions facing individual households, arguing that although the affected populations are well-educated, largely middle-class residents of an industrialized democracy they have suffered the same risks of marginalization, impoverishment and community disarticulation identified by Cernea and others as applying to displaced residents of developing countries. Questions of company and government culpability, and issues concerning the right or obligation to return will be examined in light of the experiences of the Chernobyl nuclear disaster to provide wider applicability for the lessons learned from Fukushima.



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# La différenciation territoriale de la population sur le marché du travail de la Tchouvachie à l'aspect gender

Ekaterina ZHITOVA, Natalia KARAGANOVA, Anna GUMENYUK (Russian Federation)

Pour la revelation gender les inégalités dans la société, il est nécessaire d'éclaircir, que les hommes et les femmes se distinguent dans la sphère sociale. La méthode positiviste des etudes gender suppose l'étude de la position des hommes et les femmes dans la sphère socio-économique, où il y a un aspect dans les problèmes des femmes sur le marché du travail, la politique sociale et la sphère de l'emploi. L'analyse gender de la population travaillant demande le compte variate de l'influence, des problèmes de la période de transition, ainsi que les particularités héritées économiques et sotsio-culturelles dans la position des hommes et les femmes sur de différents territoires. À la période moderne du développement du pays et les régions la signification actuelle est les questions plus le plein emploi de la population. Une grande signification a l'analyse des particularités territoriales de l'emploi de la population à l'aspect gender, qui permet d'élaborer les mesures de l'emploi des femmes et les hommes en l'activité économique, en tenant compte de la situation démographique et les besoins de l'économique dans le travail des hommes et des femmes. Pour étudier la situation gender sur le marché du travail nous utilisons la méthode de la mesure le égalité gender (GEM), qui mesure l'égalité des hommes et les femmes à l'économique, la société civile et la société politique, ainsi le degré de l'égalité des sexes dans les sphères d'activités. L'étude de l'inégalité gender de la population sur le marché du travail de la région suppose l'estimation dans la distribution des hommes et les femmes selon les branches séparées et les professions (la ségrégation horizontale), dans la comparaison du niveau du salaire, le niveau d'éducation.



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## Decomposition of Mortality Among two major religion In India: Extricate the Muslim Mortality paradox

Pushpendra SINGH (india)

INDIA is a multi-cultural, multi-ethnic and multi-lingual country. People belonging to many religions, such as Hinduism, Buddhism, Jainism, Sikhism, Islam and Christianity live in this country since time immemorial. Hindus constitute the majority of the Indian population, comprising 80.5% of Indians as of the 2001 census. 2001 Census also enumerated India's Muslim population at over 138 million (out of total population of 1029 millions), and by 2006 it have crossed 150 million. India's Muslim population is amongst the largest in the world, exceeded only by Indonesia's and close to the Muslim population of Pakistan and Bangladesh. Out of 1.2 billion people, there are nearly half a billion children in this country and a lot more remains to be done to ensure the survival, growth and development of India's greatest asset: its children. Stubbornly high malnutrition rates, poor sanitation and persistent disparities between states, social groups and the rich and the poor are just some of the obstacles faced in ensuring that every child is reached. In the last decade, there is a global consensus in terms of safeguarding the rights of children and among the most basic of those rights is the right to live. But a child's life up to minimum of five years of his/her birth is controlled not only by the biological and political environment but also a large number of demographic, economic, social and cultural factors. In India, there are only handful of researches have been attempted in this area but as studies from other developing nations suggest that the social, cultural and behavioural factors might play a dominating role in affecting child survival. Since the society and culture are so intimately intermingled with an individual's identity, that right from the chance for surviving the first few years of the life and developing behavioural characters which may determine their survival throughout the life cycle. The specific objectives of the present study are to examine the: 1. Levels and changes in child survival in India, states and districts. 2. Analyse the factors that affect dominance of Muslim children over Hindu counterparts in terms of survival. The examination of factors associated with the Hindu-Muslim gap in infant mortality in India is based on data from the National Family Health Survey (NFHS). The NFHS is a large-scale, cross-sectional, multi-round survey conducted in a nationally representative sample of households throughout India. The NFHS 1992–93 (NFHS-1) comprises interviews with 88,562 households and 89,777 ever-married women of age 13–49 years in 24 states and the National Capital Territory of Delhi. The second round of NFHS (NFHS-2) covered 91,196 households and 89,199 ever-married women of age 15–49 across all the 26 states of India. NFHS 3 interviewed 124,385 women of age 15–49 and 74,369 men of age 15–54 from all 29 states. The three NFHS surveys used standardized questionnaires, sample designs, and field procedures to collect data. Using three rounds of NFHS data, we carried out a binary logistic regression model to examine the association between infant mortality and exposure variables. All the exposure variables were tested for possible multicollinearity before putting them into the binary logistic regression model



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IGU 2015 – 1548

# The resilience of human mobility facing natural hazards. The volcanic eruptions in Ilha do Fogo (Cape Verde)

Claudio MORENO-MEDINA, Agustín NARANJO-CIGALA, Ezequiel Guerra de la TORRE, Alexandre NEVSKY, Herculano DINIS, Joao ANDRADE (Spain)

Migration patterns at the beginning of the 21st century are nothing new, but there are historical forms of spatial mobility that require a deeper analysis and understanding. This can be partly achieved by considering the cultural turn, focusing on the social and cultural behaviour of migrants in the context of individual vulnerabilities, and interpreting migration studies as an interdisciplinary field of research. The example analysed corresponds to a new interpretation of the mobility linked to natural hazards, such as volcanic eruptions. The human behaviour and attachment to the home place is analysed as a challenge to the borders of areas with volcanic risk. The study case of 2014 eruption in Ilha do Fogo (Cape Verde) shows the intrinsic spatial relation between nature and people and the resilience of human mobility overcoming natural disasters. The sway of migrations depending on the processes of volcanic eruption and on the interim stages offers a good example of the importance of social and cultural behaviour of the inhabitants of volcanic islands. The statistical information of the latest volcanic eruptions (1951, 1995 and 2014), the changes in the location of population and dwellings and, especially, the aerial photographs, satellite pictures and the gallery of shots and snapshots of the area affected by the lava flows are a powerful testimony of the cultural and economic resilience of human mobility in the context of natural hazards.



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# C12.18 Hazard and Risk

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# Impact of Artisanal Gold Mining on Soil Quality in Banyumas District, Central Java, Indonesia

Wawan BUDIANTA (Indonesia)

Artisanal gold mining is one of the most significant sources of mercury release into the environment in the developing countries including Indonesia. This study is located in artisanal gold mining activity in Banyumas District, Central Java Province, Indonesia. This study aims to examine mercury and other heavy metals contamination distribution in soil in study area. All samples were obtained from tailing and soil and were measured by using portable x-ray fluorescence (XRF). Concentration of mercury in tailing, as a source of contamination, has range from 37 to 350 ppm. Other heavy metals were also detected in this tailing. This value was very high compare to mercury and other heavy metals concentration in natural condition. The mercury concentration in soil was also detected in high concentration, following by other heavy metals such as As, Cu and Pb. The resume of this study show that soil in study area has been contaminated by mercury and other heavy metals. Future study and action for remediation of this contaminated site would be highly recommended.



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IGU 2015 – 0052

**Natural disasters and land-use/land-cover change in the southwest coastal areas of Bangladesh**

Md Ubydul HAQUE (Bangladesh)

Natural hazards and major land-use/land-cover change can have significant impacts on humans around the world. If these two concerns exist together in a coastal area, the consequences for people and the environment may be severe. This study investigated the combined effects of land-use changes and natural disasters in the southwest coastal area of Bangladesh. Satellite images were analyzed to detect changes in land cover in the study period of 13 years (1999–2012). Three areas were selected for ground data collection. Household surveys and focus groups were conducted to discover the type, level and effects of disasters. Probit regression analysis was performed to assess the relationship between various disasters with overall income, agricultural production and outward migration. Results from image analysis showed an overall 30 % increase in shrimp culture ponds in the past 13 years. Agricultural land and vegetation decreased by 48 and 3 %, respectively. Barren and built-up areas increased by 73 % due to both land-use activity and natural hazards. Analysis of household data showed cyclones and storm surges had important effects on income, agricultural production and migration. Sustainable management and enhancement of resilience capacity of this area will be crucial in the near future.



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IGU 2015 – 1431

## Geinformational technologies for thematic mapping based on remote sensing data

Paul KARGASHIN, Boguslav NOVAKOVSKIY, Anna PRASOLOVA, Roman PERMYAKOV (Russian Federation)

Maps and actual remote sensing data are fundamental models of the reality. They are the most popular data sources for thematic mapping and often supplement each other. These two data sources have some similar properties. It means that the same processing method can be applied as for maps so to space images. Typical example is DEM development and its further interpretation. Research group of Digital Cartography and Photogrammetry Laboratory are mostly aimed at constructing DEMs for thematic mapping purposes. The main source for DEMs is space images of high resolution. General idea is DEM creation via photogrammetric technologies and GIS processing to get precise and correct outcome. Image processing is usually performed by means of Digital Photogrammetric Stations. They allow to shorten time wastes and perform some operations in automatic mode. Our researches figured out that DEM based on space images has higher precision comparing with DEM created from topographic map. Describing two-stages method was implemented to study disastrous floods. Up-to-date DEM and some auxiliary data allowed to estimate damage caused by flood. There were studied floods in Krymsk, Blagoveschensk, Altay region. Particular results are presented on maps, which show damaged area. Another application of method allowed us to estimate environmental danger of mountain reservoirs. This research was performed for Spandaryan reservoir in Armenia. Results of each particular research are shown in series of maps. Maps show source DEMs, derived data (height, slope inclination, curvature etc.) and final result.



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**Transformation of landscapes of coast Caspian Sea and experience of landscape planning**

Ramiz MAMMADOV, Elbrus ALIZADE (Azerbaijan)

Active anthropogenous influence on unstable landscapes of the western coast of Caspian sea and building huge quantity of recreational and infrastructural objects have led to strong transformation and degradation of geocomplexes of the given region. Considering the complex factors influencing dynamics, development of geosystems of coast, namely endo - and ekzodynamik active reliefforming, climatic changes and fluctuation of level of the Caspian sea, us are investigated landscape complexes of the western coast of Caspian sea, including Azerbaijan, Iranian and Russian parts. It is revealed, that landscapes of coast depending on degree of anthropogenous influence are most strongly transformed around Absheron peninsula, Makhachkala-Derbant plains, and also the Iranian part of coast around a mouth of river Sefidrud. It is established that aridization of climate and anthropogenous influence have led to activity of desertification of coastal landscapes. Considering all factors of influence, for the first time large-scale summary landscape mapping of the western coast of Caspian Sea is spent. With a view of improvement and optimization of strongly transformed and degraded landscapes of representative sites around plains South-eastern Shirvan and the Nabran beach are allocated and landscape planning of territory has been spent. At the result of complex analysis the crisis sites of degradation of landscapes are revealed, made thematic and summary map-schemes of landscape planning and concrete actions for improvement of geocomplexes are developed.



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**River runoff of boreal watersheds with anthropogenically transformed land cover**

Zakhar BORTNOVSKY (Russian Federation)

This work is in the field of landscape-hydrological research. The study is used river runoff data and remote sensing data. Land cover of parts of several small river basins is investigated. River basins are located in the Vologda region, on the north-west of Russia. The investigation is performed with help of geoinformation technologies, Landsat images and digital elevation models. Parts of river basins is the watersheds, which are defined in accordance with the gauging stations. Land cover differences of examined watersheds conditioned mainly by ratio of forest and non forest lands. Data from gauging stations is used to detect an influence of land cover features of watersheds on river runoff in the course of year.



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# Estimation of social-economic risks for the territory of adverse and dangerous natural phenomena spreading

Svetlana BADINA (Russian Federation), Vyacheslav BABURIN (Russian Federation)

Relevance of this study caused by increased importance of natural hazards and their catastrophic consequences for the world (in particular Russian) population and economy. To assess the socio-economic risks of natural hazards, we developed a group of indexes, which based on a comparison of the accumulated territorial socio-economic potential and the probability of natural hazards. At creation of methods, we relied on principle: natural hazards show their essence only in the human exploration territory. Otherwise, it can be named only as ordinary natural phenomena. According to this we first developed the concept of "density of accumulated territorial social-economic potential." For this purpose, we considered the socio-economic characteristics of the territory outside the administrative borders (inside the administrative borders, we investigated only human exploration areas). Testing of our methods was made on the example of a group of North Caucasus regions (the level of municipalities). We detected zones with different levels of risk. It is allowed to select municipalities, which need more large-scale studies (for example we did this for Sochi, the capital of Winter Olympic Games 2014). As a result, we have created a series of maps and typology of municipalities. It based on a combination of two parameters: the probability of natural disasters (in our case – floods, avalanches, and mudflows) and the level of socio-economic potential. The high density of the socio-economic potential of the territory provides high development prospects. Thus development of hazardous areas is most likely (due to limited land resources). Therefore we must take into account the risks of natural hazards and the proposed method is a necessary tool for this. This methodology can be used to develop monitoring systems, programs to protect the population and economic objects, territorial planning and economic development.



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**Land Use-Vegetation-Landslide Interactions In The Mountainous Region Of Rio De Janeiro State: Basis For Risk Assessment And Management**

Ana Luiza COELHO NETTO (Brazil), Anderson Mululo Sato (Brazil), Leonardo Esteves de Freitas (Brazil)

The risk magnitude of landslide and flooding related disasters are increasing in the mountainous region of SE-S Brazil. Extreme rainfalls are expected to occur in the rainy period and they may trigger landslides, but their mechanisms and magnitude are related to local geomorphological and geological-geotechnical controls variable interactions with land use and vegetation cover. The magnitude of social-economic and environmental losses and damages are related to recent human induced environmental changes. Examples of land use-vegetation-landslide interactions will be discussed here bringing into view a study case at Nova Friburgo municipality in the state of Rio. This area was largely affected by the very extreme landslide disaster in the Brazilian records, in January 2011, with more than 500 deaths and more than 1,000 deaths in the surrounding municipalities. Since then a governmental warning system has been implemented to reduce the risk level, including the installation of sirens and refuges to move people during heavy rainstorm periods. However there is no efficient connection between the alarm system and the spatial variability of landslide susceptibility and risk evaluation. Therefore most population (>80%) do not respond to the alarm system and conflicting interests between the local communities and governmental institutions led to the organization of a multi-institutional collaborative network by integrating university, local society and government: the main goal is to develop, collectively, a new model for risk management.



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## Landslide risks in Chuvashia

Nikolai PETROV (Russian Federation), Inna NIKONOROVA (Russian Federation)

Types and mechanisms of landslides on the territory of Chuvashia (Russia) are in relationship to geological and geomorphologic features, including the age and stage of development of the slopes of river valleys, gullies and ravines systems. A variety of factors of relief-forming allowed us to distinguish three types of regional formations of landslides in the Chuvash Republic of the Middle Volga region (Russia): 1) landslides on the right bank of the river Volga, 2) landslides in the valley of the river Sura, and 3) landslides in the valleys of small rivers. They represent simple and complex, mono-block and multi-block, one-stage and multi-stage, and one-story and multi-story types. All of them differ in mechanism, in timing and intensity of flow, and also by the impact of economic activity and the scheme of anti-landsliding measures. The right slope of the Volga is more susceptible to landslides, and for the Sura is the left slope. All the banks of the Volga are composed of a part-crystalline rock complex of the Upper Permian. The banks of the Sura are composed of Mesozoic plastic clays. The streambeds, under the river sediments, are composed of common Permian rocks, though to south – Jurassic rocks. Some of the small rivers in the western part and in the southern half of Chuvashia flow into the Mesozoic clays. Landslides in the valleys of small rivers in the north-eastern part of Chuvashia in the Permian formations are extremely rare.



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# The Environmental Geomorphological assessment for urban expansion in Al- Khiran Marine city- Kuwait

Ahmed HASSAN (Egypt)

The Environmental Geomorphological assessment for urban expansion in Al- Khiran Marine city- Kuwait Dr- Ahmed Hassan (1) prof- Magdy Torab (2 ) Key words: Kuwait, Khiran, Environmental Geomorphology, Urban Geomorphology ABSTRACT: Al-Khiran city is located in the extreme southeast coast of the State of Kuwait, near the border of Kuwait and Saudi Arabia. Al-Khiran city witnessed massive urban developments and changes in the geomorphology of its coastline, especially after the starting of the Project of Al- Khiran Marine city. The city is currently implemented through five stages. The first phase (A1) finished in 2003, then the second stage (A2) in 2005. And the third one (A3) in 2009. The fourth and fifth phases are completed nowadays.That marine city caused geomorphological changes in the shape, topography and the lengths of coastline. As a result, some natural geomorphological phenomena have vanished and were replaced by artificial forms, for example, The natural Khours have Turned into artificial ones and the phenomenon of the tides on the coast line disappeared and was replaced by artificial beaches and put them sands from the desert were washed. The sabakhas disappeared also and replaced by residential areas or entertainment resorts and added to Khours artificial islands. Consequently, the length of the coastline has increased from 22.6 km in 2000 to 109.4 km in, 2013. After the end of the project, the coastline will become, about 250 km, and therefore the monitoring of these changes and comparing change detection reveals a lot of dysfunction and environmental destruction caused by human influences. The aim of this paper is to follow and assess the environmental geomorphological changes in the study area to realize the dangers resulting from the urban development in Al-Khiran area. The previous procedures happen through measuring the biodiversity, landforms and geomorphological processes on the coastline of the city. The study uses several means and ways such as: Field study, Comparing maps and the old space image with the new one, and collecting and analyzing soil samples from the bottom of the Khours and beaches and water samples to study biodiversity and ecosystem linked with urban development and the success and failure of the city as an ecosystem. (1) Ph. D. physical Geography, ameh812000@gmail.com (2) Professor Physical Geography, magdytorab@hotmail.com

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**Risks of natural-technological accidents in Russia: geographical analysis of the database**

Elena PETROVA (Russian Federation)

In recent years, the number and severity of natural-technological accidents and disasters are increasing all over the world. The term "natural-technological" applies to both human-induced intensification of natural risks and technological accidents triggered by any natural process or phenomenon. The growth of natural-technological events is caused, on the one hand, by the observed increasing in the activity and dimensions of various natural hazards and, on the other hand, by the much more complicated structure of modern technological systems prone to natural hazard impacts, as well as by increasing advancement of economic activities and population into areas at natural risk. A distinctive feature of natural-technological events is their multihazardous and synergistic nature. Usually it is very difficult to deal with the consequences of such multihazardous events, because one has to cope not only with the primary aftermaths of natural disasters, but also with the secondary effects of a number of simultaneously or successively triggered technological accidents, which can be even much more serious. These mutual impacts of natural hazards on the technosphere and human-induced impacts on the environment are the more severe the higher are the population density and concentration of industrial facilities and infrastructure (especially, hazardous objects, such as nuclear power plants, oil refineries, chemical plants, piplines, etc.) in affected areas. The author created a database of natural-technological accidents occurring in Russia. The collected information allowed us to analyze the main causes and triggers of such accidents, their distribution in place and time and reveal "weak spots" to cope with.



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**The System of National Indicators for Evaluation of the Progress in Combating Land Degradation (the experience of Belarus)**

Valentin YATSUKHNO, Vladimir SAVCHENKO, Sergej SAUCHYK (Belarus)

The elaboration and implementation of the system of progress evaluation indicators is the important tool for assessment of the efficiency of actions aimed to combat land degradation. The National Action Programme (NAP) to combat land degradation in the context of obligations under the UNCCD was finalized in Belarus in 2014. The NAP includes 26 biophysical and socio-economic indicators, harmonized with the 10-year Strategy of the UNCCD and based on national requirements and capabilities. The purpose of the system of indicators is to achieve the following 4 strategic goals of the Convention: - improvement of living conditions of the affected population; - improvement of the state of the affected ecosystems; - achievement of global benefits; - mobilization of resources. National targets for the period until the year 2030 (divided into 5-year periods) are defined for 11 key indicators. This concerns primarily such types of land degradation as water and wind erosion, mineralization of ameliorated peatlands, content of humus in arable soils, the portion of land used for organic agriculture, the area of land contaminated with radioactivity due to the accident at Chernobyl NPP.



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**Identification of technogenic dust in Murmansk city based on the results of chemical analysis**

Roman KAZYULIN (Russian Federation)

Murmansk City, the largest city in the world above the Arctic Circle, affected strong anthropogenic impact. However, one problem for citizens become more significant than chemical pollution of the atmosphere. This problem is a dust pollution. The number of complaints of technogenic dust settling in the city have been increased in recent years. Black powder on the streets, windowsills and all horizontal surfaces became a habitual nuisance. In 2013 and 2014 years the Center of the laboratory analysis and technical measurements (CLATI) of Murmansk conducted a research of potential source of technogenic dust. These researches shown where the dust components were formed. One of the centers of production of the dust is CHP, which emitted the dust during the combustion of fuel oil. The second center is the Murmansk port, which annual volume of coal production reaches 14 million tons. The third source of technogenic dust is on-road transportation - the one of the largest consumers of diesel in the arctic region. But it is very difficult to count up cumulative percentage of each source. That's why methods of research in 2013 and 2014 require's in more detailed analysis. In 2015 CLATI and International ecological fund "Clean Seas" have started the study of this problematic issue using new methods and scientific equipment. The first results of this collaboration will be presented after first stage of research - in the end of first quarter of 2015 year.



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IGU 2015 – 0356

# Dangerous hydrological phenomena at the Don river mouth and the influence on them of water management actions

Dmitry MAGRITSKY (Russian Federation)

Socio-economic complex, natural objects and systems at the Don River mouth are affected by a series of dangerous hydrological phenomena. These are inundations during the spring flood and accidental water discharges from the Tsimlyansk reservoir, storm surges, heavy rain flooding in urban areas, water shortage, wind ebbs, dangerous ice and morphodynamic phenomena, deterioration of water quality. Flood situation is developing in the last decades in the conditions: 1) reducing the average (from 27.4 to 21.5 km3/year) and maximum (3.5 times) water runoff of the river, 2) artificial redistribution of flow between months 3) forced channel erosion (its average value is approximately 0.5-0.8 m), 4) sea level rise (at a rate of 1-2 mm/yr) and the total intensification of marine factors, 5) a series of protective measures, including the creation in 1952 of the Tsimlyansk reservoir. As a result, the date of maximum water flow has changed; maximum water levels has decreased by 0.5-2.5 m; frequency and magnitude of flooding has decreased too. If in 1917-1951 the frequency of flooding the floodplain was 86%, now it is only 17%. The average duration of flooding was reduced from 50 to 14 days, the total area - from 1110 to 920 km2. On the contrary, surge phenomena not only retained their hazardous characteristics, but also increased the frequency and magnitude. Only in the last 20 years, four large-scale surges flooding occurred in the Don river mouth. Strong surges repeat an average of 1 every 10 years. The problem of water shortages and maintaining favorable navigational depths has to some extent been solved after the creation of the reservoir and in the context of sea level rising. Influence of wind ebbs is not weakened; water quality has deteriorated, the salinity has increased.



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**Coal Mining and Rural Livelihoods in Chhattisgarh , India: An Empirical Analysis**

Pushpendra SINGH (India)

India has the fourth largest coal reserve in the world with 9 per cent global share of coal. This coal reserve is distributed in different parts of the country; Chhattisgarh has second largest coal reserve (87 BnT1) (IBM, 2011) and contribute 18% national production. This state has the maximum number (12 numbers) of coalfields in the country, chiefly operated by SECL (South Eastern Coalfields Ltd), and other companies including Tata Steel and IISCO (Indian Iron & Steel Company). The approximate production of coal in Chhattisgarh is 76.5 million tonnes annually (approx), and through it the state earns 7000 million rupees annually, these facts clearly indicate that economy of the district is mainly coal based. Additionally, due to heavy industrialization, Raipur district is considered as one of the 15 fastest growing cities of India and is also among one of the 100 fastest growing cities of the world.2 The coal reserves are concentrated mainly in forest and river basin area of the state. The inhabiting tribes and marginalized community of this area are backward and has experienced with both the positive and negative consequences of mining activities. In the positive side, it is observed that the local people get job opportunities directly in this mining activities and because of multiplier effect they even get other job opportunities indirectly which significantly improves the standard of living of inhabitant population of the area. The Census of India, 2001 data point out that around 24 per cent of main workers are directly involved in mining work; additionally around 30 per cent migrants are also directly engaged in mining work in the state. The Coal India, mentioned in its report that under corporate social responsibility (CSR) they are investing money to develop community and infrastructure in mines peripheral area as well as they also organizing health and sanitation awareness campaigns time to time (Coal India, 2012). According to the data from the Annual Health Survey (AHS, 2010-11), access to healthcare is very high in the Chhattisgarh districts; around 94 per cent people have access to any type of health care service in the state. Objectives of the Study: 1. To examine the levels and patterns in the distribution of the five capitals (namely, natural, human, social, physical and financial capital) in mining affected and non-mining affected villages 2. To analyse the nature and extent of occupational diversification and its association with migration in the mining affected and non-mining affected villages 3. To study the differences in the household living environment, health and education across mining affected and non-mining affected villages 4. To understand community perception regarding effects of mining on sustainable livelihoods 5. To discuss the role of government and civil society in mitigating the negative effect of mining on rural livelihoods Hypothesis of the study: H1. Mining has supported and promoted sustainable and diversified livelihoods H2. Mining affected villages are disadvantaged in terms of health, education and environmental assets H3. Mining affected villages have significantly higher inequalities in the distribution of capabilities, assets and activities H4. Government, civil society and local communities wear a positive outlook towards contribution of mining towards sustainable livelihoods



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**Landscape evolution on the bottom of drained thermokarst lake (a case study in the European Northeast of Russia)**

*Dmitry KAVERIN, Alexander PASTUKHOV, Nikolay KAKUNOV (Russian Federation)*

The evolution of soils and landscapes has been studied in a lake bed of former thermokarst lake, which was totally drained in 1979. Melioration of thermokarst lakes was conducted experimentally and locally under Soviet economics program during 1970-s. The aim of the program was to increase in biomass productivity of virgin tundra permafrost-thermokarst sites under agricultural activities. The former thermokarst lake "Opytnoe" located in the Bolshezemelskaya Tundra, Russian European Northeast. The lake bed is covered by peat-mineral sediments, which serves as soil-forming sediments favoring subsequent permafrost aggradation and cryogenic processes as well. Initially, after drainage, swampy meadows had been developed almost all over the lake bed. Further on, succession of landscape went diversely, typical and uncommon tundra landscapes formed. When activated, cryogenic processes favored the formation of peat mounds under dwarf shrub - lichen vegetation. Frost cracks and peat circles affected flat mounds all over the former lake bottom. On drained peat sites, with no active cryogenic processes, specific grass meadows on Cryic Sapric Histosols were developed. Totally, permafrost-affected soils occupy 77% of the area (2011). In some part of the lake bed further development of waterlogging leads to the formation of marshy meadows and willow communities where Gleysols prevail. During last twenty years, permafrost degradation has occurred under tall shrub communities, and it will progress in future. Water erosion processes in the drained lake bottom promoted the formation of local hydrographic network. In the stream floodplain grassy willow-stands on Fluvisols formed (3% of the area). The study has been conducted under Clima-East & RFBR 14-05-31111 projects.



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**About the results of gally erosion monitoring in the territory of Udmurt Respublic**

Ivan RYSIN, I.I. GRIGORIEV (Russian Federation)

In order to study the ravine formation mechanism and recieve some quantative characteristics of their seasonal and annual increase some semystationary observations for the growth of more than 160 ravines at 28 key sections located in different landscape conditions are being conducted from 1978 year. The territory of Udmurt Respublic is located in the east of the Russian Plain in the southern part of the Vyatka-Kama interstream area. By using the method of bench marks, located along the draine line it is possible to determine the rate of ravine growth. At the majority of the stationaries (93 ravines) observations are carried out once a year (usually July) and at 10 key places (46 ravines) measurements are taken twice a year (in spring and autumn). Since 1993 y. 10 ravines located in the environs of Izhevsk are additionally observed in summer after the heavy rainfalls. The mean velocity of ravine growth ranges greatly. The maximum index is 204 m/year. The mean velocity of secondary ravine growth (1,4 m/year) exceeds that of the primary ravines (1,1 m/year). Bed ravines washing away loamy, sandy, alluvial and gully deposits have the greatest many-years velocity of growth (2,2 m/year). In the context of many years about 80% of annual ravine increase is produced by spring water draine. However during the years of extremely heavy rainfall 90-94% of annual ravine growth is noticed at some key-places. The growth of certain ravines may exceed annual norm in tens times.



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## Hydrological regime fluctuations and its dangerous consequences for the rivers of European part of Russia

Maria KIREEVA, N. FROLOVA, E. RETS, E. TELEGINA (Russian Federation)

Extreme hydrological events on the rivers of European part of Russia are closely related to the transformation of the hydrological regime due to the recent climate changes. Rivers in this region used to be traditionally attributed to the Eastern-European type with well-pronounced seasonal flood wave and quite low flow period. Currently, the ratio between runoff in different periods of the year is changing dramatically. Statistical and spatial analysis of data from 300 gauging stations shows, that these changes are represented by an increase in low flow and a reduced runoff during high-water period. The decline of seasonal flood is most evident in those regions where the low flow period runoff is growing the most. The main goal of this work was to determine the impact of water regime changes on the occurrence of extreme hydrological events. It should be noted that according to the calculations arising now extreme hydrological events are not exclusive. During the period of long-term observations, there are cases of deeper water shortages. All the rivers of the European part of Russia is characterized by a reduction of scarce periods. For the Volga and the Don River basin real deficits in general no longer occur since 1975-77 years mostly. For the Northern Rivers and Kama basin frequency and severity of extreme high water periods increases, while for the south and center of the European part of Russia, by contrast, is reduced. The study was supported by the Russian Science Foundation (grant No. 14-17-00700).



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**Gis based flash flood runoff simulation model for upper teesta river basin - using aster dem and meteorological data**

Abhisek CHAKRABARTY, Subhra MANDAL (India)

Flash flood is one of the catastrophic natural hazards in the mountainous region of India. Teesta Watershed in Sikkim-Derjeeling Himalaya is a probable flash flood occurrence zone. The present study describes an attempt to model surface runoff in upper Teesta basin, which is directly related to catastrophic flood events, by creating a system based on GIS technology. The main object was to construct a direct unit hydrograph for an excess rainfall by estimating the stream flow response at the outlet of a watershed. Specifically, the methodology was based on the creation of a spatial database in GIS environment and on data editing. Moreover, rainfall time-series data collected from Indian Meteorological Department and they were processed in order to calculate flow time and the runoff volume. Apart from the meteorological data, background data such as topography, drainage network, land cover and geological data were also collected. Clipping the watershed from the entire area and the streamline generation for Teesta watershed were done from Aster DEM data using the ERDAS IMAGINE 9.0 and Arc GIS 10.0 software. The analysis of different hydraulic model to detect flash flood probability ware done using HEC-RAS, Flow-2D, HEC-HMS Software, which were of great importance in order to achieve the final result. 313 Sq. km area were found to be most vulnerable to flash flood includes Melli, Jourthang, Bardang, Singtam, Chungthang and Lachung village and 655 sq. km. as moderately vulnerable includes Rangpo, Yathang, Dambung and Thangu Valley. The model was validated by inserting the rainfall data of a flood event took place in August 1968, and 78% of the actual area flooded were reflected in the output of the model.



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**Resilience and the memory of catastrophes**

Antoine LE BLANC (France)

The perception of risks and the memory of past disasters play a crucial role in the complex network of processes and actions which the concept of resilience encompasses (Comfort et al., 2010). Cities are studded with traces of disasters which have been integrated into the local cultural capital, in the acknowledged aim of keeping their memory alive and facilitating how future events are handled (Jackson, 2005 ; Le Blanc, 2010). However, there are also countless examples of aborted attempts at risk management in spite of existing traces and memorial policies. Which memory should be privileged in order to initiate or build on resilience strategies? The territorialization of risk markers helps pinpoint urban resilience and changes in city management. These markers form a territorialized, normative collective memory (Halbwachs, 1950) sometimes used as a base for policies aiming to reconstruct urban identities, sorely put to the test by the growing complexity of interactions between city scales and key decision makers.



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## The Relationship between Real Estate Transactions by Fukushima Refugees and Land Price Changes after the Great East-Japan Earthquake

Shin'ya KAWAMURA (Japan)

The Great East-Japan Earthquake and the accident at the Fukushima nuclear power stations significantly damaged public trust in the safety of nuclear power. The earthquake and tsunami thus caused not only physical damage and radioactive contamination, but also psychological and social damage to residents. This study focuses on changes in land prices and the buying and selling of real estate after the Great East-Japan Earthquake, and clarifies the relationship between real estate transactions by Fukushima refugees and changes in land prices. The results of the study show that in Miyagi Prefecture and Iwate Prefecture, land prices are rising in the inner cities of Sendai region and the coastal region of the stricken area. On the other hand, with the exception of the residential area of Iwaki city, land prices in Fukushima Prefecture are generally falling. This study finds that real estate transactions and land prices changed after the earthquake in Fukushima Prefecture, but that while the amount of buying and selling increased along with demand, land prices did not increase almost at all. This differed from the land price fluctuations in Miyagi and Iwate Prefectures. There is a possibility that the high levels of radiation in Fukushima Prefecture will prevent many evacuees from returning for a long time. This study suggests that these evacuees social and psychological anxiety about their new potential homes is preventing an increase in land prices in areas where buying is on the rise.



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**Environmental hazards, vulnerability and sustainability issues in sunderbans of West Bengal,India**

Twisha SINGH, Anuradha BANERJEE (India)

The Sunderban Delta lying in the district of South 24 Parganas, West Bengal, India, represent diverse characteristics of geo-ecological settings, ranging from stable delta and wetlands of the Eastern Kolkata in the North towards mudflats of the active deltaic regions of the Bay of Bengal littoral in the South. The deltaic region of Sunderbans is highly unstable due to exposure to ecological risks and natural hazards. Scientists believe that frequent subsidence of the littoral part of Sundarbans that resulted in the disappearance of great coastal forests (mangroves), busy ancient ports of Bengal are due to the "Swatch of no ground" in the Bay. The region experiences the risks of rigorous salinity, severe soil erosion, furies of storms and cyclones originating in the Bay of Bengal, tidal bores and periodic inundations. Earthquakes have also played havoc causing considerable damage to the region. Moreover, global warming and sea level rise are contemporary serious threats for the entire region. Against this backdrop, the present article tries to provide an inventory of ecological risks and natural hazards and their manifestation in the form of changing geomorphology, unsustainable livelihoods and human disasters. An attempt is made to assess the population vulnerable to natural hazards and disasters through a 'Composite Vulnerability Index' that depicts the overall levels of resilience of the community. Results depict that Sunderban Delta has the highest vulnerability of population due to lack of proper awareness, impoverished livelihoods, lack of infrastructure and low adaptive capacity compared to its outer peripheries.



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**Creation of tools of warning and prevention of impacts of the dangerous natural disasters**

Evgeny VYAZILOV, N.CHUNYAEV (Russian Federation)

In spite of the use of the high-automated systems of observation, collection, storage, processing, prognosis and delivery of information of environment, the size of damage increases from the natural disasters. It is related to that information about environment, delivering on industrial enterprises, is effectively not enough used. For the increase of this efficiency, it is possible: to organize automatic notification of persons and a decision-making (DM) about arising up natural disasters through software–agent, working on a mobile internet-device; to represent information in a compact kind on the screen of computer; to estimate a possible damage from natural disasters and expense on preventive actions; to give out information about affecting of environment industrial enterprises, population and to recommendation for DM; to present information as interactive maps, charts, tables. Tools of the notification of the DM about the arisen natural disasters through the software – agent are working with use of critical values of indicators of natural disasters for each type of enterprise and a technological process. The software–agent is adjusting by the user under concrete object, region, influencing natural disasters. Information by means of the compact scheme reflecting the environment parameters influencing industrial enterprises in the form of devices (the thermometer, the aneroid, a speedometer) are visualizing with values of the indicators which exceeded critical values. DM must understand possible impacts from natural disasters and lean on recommendations, given out by the system for decisions support. Delivery of information about possible impacts of natural disasters and recommendations leans on the knowledge, formed on the base of the accumulated experience. The type of information (observing, forecasting, climatic, after the phenomenon), season of year, climatic zone, level of making decision is thus taken into account. The testing base of critical values are created, the formalized information on impacts and recommendations for natural disasters are collected.



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**Flood risk of the middle reaches of the Amur in land cover changing**

Shigeko HARUYAMA, Mizue MUROOKA (Japan)

The Sanjiang Plain is one of remarkable land use change in the north-eastern China for agriculture development from the 1950's and the wet land ratio has been decreased until the present period. The rapid change in its land cover has caused serious flooding in the middle reaches of the Amur river basin, in the contrast, the Kiya River Basin in Russia, located on the opposite side of the Sanjiang Plain, has not experienced a change in land cover. In the view of geomorphologic structure of the middle reaches of the Amur, the flood risk was assessed initially; and land cover/land use change was clarified in the middle reaches of the Amur using SRTM and JERS-1/SAR data for clarified their relationship between land cover and landform. The Kiya River Basin was clarified the wet land condition and the human impact of each Plain was analyzed. Vegetation on each wetland was recorded and the heights of slightly elevated areas were measured with a hand level they were recorded on the geomorphologic land classification map and the parameters of discharge, precipitation and temperature were analyzed with each parameter using the method of Mann-Kendall Test which was often used in analyzing the direction of the time series because it was rarely affected by the outlier and non-data period since 1940 until 2004 considering the discharge data. In general, when land use is changed, climate is altered by changing the area of nonabsorbent soil and the amount of vapor and so on, or by increasing CO2 emission by forest logging. These factors lead to depletion of the water resource or to the degradation of biodiversity. In the Sanjiang Plain, wetland reclamation leads to ground water deterioration or to an increase in the area of nonabsorbent soil and finally to increasing discharge into the Amur River. Time series of annual temperature and precipitation were ascending, while time series of discharge was descending in the Sanjiang Plain. This means human impact affects discharge more than does climate. Time series of minimum discharge changes corresponding to history of irrigation and flood control in the Sanjiang Plain. Almost all months of minimum discharge occurred in March, just before snow melting. The minimum discharge increased by reclamation and drainage in 1947 - 1961, decreased by constructing banks in 1962 - 1975, fluctuated little and stably increased because of dams and irrigation in 1976 - 1987, drastically increased because of irrigation and the high level of conversion of crop fields to paddy fields in 1988 - 1997, and slightly decreased because of dam construction after 1998.



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**Drought risk, impacts and adaptation by natural resource dependent communities for resilience in rural Uganda**

Shuaib LWASA, Susan NANDUDU (Uganda)

Climate change is affecting rural communities unequivocally and the magnitude, severity and frequency of drought risk differs from one locale to another. At micro scale, climate change risk trends and hazards have a strong spatial variability that couple with social, economic and geographic conditions to create differing vulnerabilities. This paper analyzes the community specific vulnerabilities and impacts of climate change in a rural community with varied geographies across social, economic and environmental profiles. As a natural resource dependent community, evidence strongly suggests increasing climate risks and impacts that are worsening the already grim conditions of the community. The assessment utilizes scenario-based framework that integrates community evaluation of vulnerability with climate data analysis to analyze current and future vulnerabilities. Various community strategies of the community that form the back borne livelihoods are analyzed in respect to the climate change risks to establish the resilient capacity of the community to current and future vulnerabilities.



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**Analysis of the Fukushima nuclear disaster in Japan socio-economy : the industrial structure of Fukushima post 3.11**

Noritsugu FUJIMOTO (Japan)

The great earthquake that struck the east of Tohoku Region in Japan, on March 11, 2011, gave rise to a huge tsunami and caused the hydrogen explosion at the Fukushima Daiichi nuclear plant the day after the natural disaster. The east of Fukushima Prefecture and the neighboring areas were contaminated with radioactive materials emitted and piled on the ground after the plant explosion. The Cabinet decision permitted only persons living within 30 km of the plant and other hotspot areas in several small towns and villages to evacuate their residences and receive compensation from the Tokyo Electronic Power Company (TEPCO). A dose greater than 5 mSV was observed each year in many areas outside of the evacuation zone, and voluntary organizations still perform measurements and confirm the high dose rates shown on the maps. If we apply lessons from Chernobyl to Fukushima, the two-thirds of Fukushima Prefecture called Hamadori (costal area) and Nakadori (inland area) should be authorized as an evacuation zone. However, the contaminated areas are not yet allowed to be part of the evacuation zone. From the viewpoint of governmental budget constraints, this paper examines reasons the government has never given an evacuation order to areas with more than 5 mSV per year. Both TEPCO and the government seek to obscure the accident and its resultant damage; they avoid clearly explaining the entire contaminated zone. Therefore, the evacuation zone is set only for a 30-km radius of the plant and the area over 20 mSV because the central and local governments and TEPCO manage to compensate at a minimum cost by means of decontamination projects. Ignoring possible public health risks, the governments and TEPCO can ensure the national economy's balance by avoiding the issue of a new, astronomical, and unaffordable national bond for the indemnity additional evacuation compensation.



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**Disaster Chain Risk Assessment in the Suizhong Coastal Zone of Bohai Sea, China**

Xuegong XU, Lifen XU (China)

It is an important field and a challenging issue to study on risk of disaster chain. Coastal zone is a vulnerable area with multiple hazards, which is potentially to be a disaster chain-prone region. Meanwhile, the coastal zone has a dense population and rapid economic development. Once natural disasters happen, it must result in serious social and economic losses. Therefore, Suizhong coastal zone of Bohai, China is chosen as the study area, and "Sea level rise coupled with storm surge—sea water submerging, coastal erosion hazard chain" is chosen as the hazard case. The propose is to explore the methods on disaster chain risk assessment. The disaster chain risk assessment is based on the theory of natural disaster risk assessment which is composed of hazard, vulnerability and receptor analysis. As disasters interaction time has effects on the risk assessment results, the hazard duration 2 hours, 6 hours and 12 hours are considered respectively for the chain risk assessment. The assessment result shows that the highest risk area is located in part of the sandy coast, followed by coastal ports. The impact of disasters interaction time on the submerging loss is significantly higher than on erosion damage. According to the assessment results, risk prevention measures of the disaster chain are proposed. This research is financially supported by the NSFC Project (No.41271102).



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**The results of research of the river-bed processes in the territory of Udmurt Respublic**

Ivan RYSIN, L.N PETUHOVA (Russian Federation)

Since 1999 annual fieldwork on the survey of lateral river-bed slip is being held at some streams of the Udmurt Respublic in summer. For this aim about 300 bench marks are made on actively washed out stream sections. Repeated tachometrical survey is held on 30 sections annually. Analysis of the field data obtained at the key sections for the last fifteen years shows a wide range of the lateral washout velocity. On morphometric data it was defined that within the basins of the rivers studied the rivers having right-sided flood land with the left-sided horizontal deformations predominated. They numbered from 39% in the Tcheptsa stream basin till 47% in the Izh stream basin. The size of river-bed silting up and the thickness of anthropogenicaly formed silt layer on the flood lands varied from 0 m to 1,5-3,0 m and depended mainly on the extent of economical development of the basin drained. When the repeated measurements had been made they resulted in the following: the meanings of the annual wash out of river banks varied greatly. The maximum wash out was marked in 2005 year at the Vyatka river near Krimskaya Sludka village ( 25 m per year). Considerable sizes of lateral wash out were also characteristic of the Tcheptsa, the Kilmez, the Vala, the Siva, the Izh, the Sharkan, and other streams, where the wash out reached 5-7 m at certain sections.



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**Key Vulnerability Factors for Risk Construction**

Mary Frances RODRIGUEZ VANGORT, Carol HERNANDEZ (Mexico)

The United Nations (2013) estimated that 2,163 disasters associated with hydro-meteorological phenomena occurred between 2000 and 2006. These events caused 290,000 human deaths, more than 1.5 millions of individuals affected, and economic losses for about 422,000 millions of dollars. In this context, to determine and value analytical parameters such as the vulnerability of populations and territories, results relevant to mitigate the impact of disasters. Since the implementation of the United Nations International Strategy for Disaster Reduction (UNISDR) and the International Decade for Natural Disaster Reduction (1990-1999), the research area on risks has been widely developed. An outstanding result is the recognition of vulnerability as a very significant factor for the analysis of risks. Vulnerability is an element such complex that its study has required the development of multiple methodologies. Many scholars have opted for analyzing one type of vulnerability (social, economic or structural) for a specific risk. Likewise, others components such as risk perception, governability, governance and public management have been incorporate to the discussion. It have been emphasized that the study of vulnerability requires the selection of variables that are significant and dynamic. The objective of this paper is to identify some essential variables of vulnerability that participate in the construction of risk. It is achieved through a comparative study of two localities with volcanic risk in Mexico: Tectuapan, Chiapas, in the surrounding area of the Chichón Volcano, and Orizaba, Veracruz, surrounding the Citlaltépetl Volcano.



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**Interpretation of spectral signatures through heavy metal content in plants and soil**

Elena BEREZA (Russian Federation)

As a result of different antropogeneous activities in the Russian North ecological pressure on forest tundra landscapes has increased strongly during last decades. Climatic conditions are extremely severe in the North. Natural renewal processes are very slow due to the low intensity of biological round. Vegetation species spread boundaries pass through the North regions. And all of that makes vegetation especially vulnerable to such products of antropogeneous activities as emissions of nonferrous smelting combines. For monitoring territories under industrial impact we need new approaches. These approaches should meet following requirements: considerable territory cover with the operational observation means; possibility to use such means in the regions, which are difficult of access; minimization of volume of field works and their expense as a consequence. Remote sensing meets all these requirements and could be supposed to be the most helpful methodical approach in the North regions. Our research showed a correlation between vegetation spectral characteristics and copper and nickel content in different parts of plants and in the soil. This correlation could be used for computer interpretation of spectral signatures and their classification according to the content of pollutants. That approach is very helpful for indication of pollutants contents in landscapes components and for monitoring landscapes state in the regions, which are difficult of access.



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IGU 2015 – 1084

**Environmental risks of associated petroleum gas flaring**

Tatiana PUZANOVA (Russian Federation)

The annual volume of flared associated petroleum gas (APG) in the world is 110 billion cubic meters that corresponds to the volume of natural gas used annually by both Germany and France. Russia ranked first in the world in terms of gas flaring. Only 76.2 % of APG is used in Russia. As a result of gas flaring the vast plumes of aerosol pollution is formed near flare units and a wide range of pollutants gets to the atmosphere including carbon black, nitrogen oxides, carbon monoxide, 3,4-benzopyrene, benzene, phosgene, toluene, heavy metals, sulfur dioxide, mercaptans, and hundreds of other substances, that are synergistic and belong to the I or II class of hazard. Most of these compounds fall out from the atmosphere in the range of 10 - 15 km from the flare unit and deposit on soils, vegetation and surface water bodies. Thereby the physical and chemical transformation of ecosystems occurs near flare units. In the vicinity of a flare unit as a result of exposure to high temperatures within a radius of 20-200 meters depending on the power of a flare unit, vegetation and organic matter of humus-accumulative horizons are burned out almost completely, the soil structure and the soil grading change. When burning or unburned (dispersed) oil is in the flare unit emission, the soil surface bituminization takes place. With distance from a flare unit the degree of transformation of ecosystems from exposure to heat is reduced and the chemical degradation caused by the emission of a wide range of compounds is observed as a geochemical imbalance, including a carbon-nitrogen imbalance, as a changing of many macro- and microelements migration ability, and as an inclusion of many toxic substances in the lateral and radial technogenic flows.



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**Risk Assessment Of The Altai Mountain Region Ecosystems' Disturbance As The Result Of Space-Rocket Launches**

T.V. KOROLEVA, A.V. SHARAPOVA, O.V. CHERNITSOVA, Pavel KRECHETOV (Russian Federation)

The study aims the assessment of environmental risk of the occurrence of space-rocket launches' adverse effects. The results of our experimental research and summary of published data enabled calculations of the permissible levels of chemicals' deposition on ecosystems of the Altai Mountains (acid deposition, nitrogen compounds, unsymmetrical dimethylhydrazine (UDMH)), as well as the evaluation of the permissible levels of mechanical and pyrogenic violations of these ecosystems. The critical loads' values of acidity and eutrophic action of nitrogen were calculated according to the Convention on Long-range Transboundary Air Pollution (UBA, 2004). Estimation of UDMH permissible loads was based on the original method proposed by the authors. It was fixed that the risk of acidifying action of nitrogen compounds on ecosystems' components as a result of space-rocket launches is minimal; the risk of eutrophication processes is maximal. For UDMH the greatest risk from the ingress of rocket fuel is associated with the exhibition of toxic effect. Eutrophic effect from the UDMH ingress is only possible at the very high pollutant loads. Permissible levels of mechanical and pyrogenic effects were analyzed considering the probability of damage and the recovery rate of the landscapes' impaired biotic components. The safe load was defined as the percentage of the particular ecosystem's area which can be damaged per year. The results provided the estimation of the environmental risk of mountain ecosystems' technogenic transformation under the impact of space-rocket launches. GIS-mapping of environmental vulnerability for one of the space-rocket launches' impact zones in the Altai Republic was carried out. The study was funded by Russian Science Foundation (grant №14-27-00083).



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**Eutrophication risk of the coastal waters in the north-eastern Black sea**

Antonina POLYAKOVA (Russian Federation)

The increasing human pressure on the coastal zone of the Black Sea is the risk of eutrophication of its waters. On the example the Gelendzhik Bay can trace this phenomenon. The impact of anthropogenic pollution on the bay waters is determined by the intensity of discharge into the bay of pollutants from continental runoff and by the rate of their removal to the open sea. The main volume of pollutants enters the south-eastern part of the bay with the drain of the river Su-Aran, where the concentration of pollutants is almost always exceeds the maximum allowable concentration. Favorable conditions for the purification of the bay from the pollution created by circulating water that arises in the north-east wind. In calm weather conditions, water pollution may exceed background values several times. The great importance is the impact on the marine ecosystem of the pollution water with organic matter coming with utility fluids. As a result of its destruction in the sea water is the increase of well assimilated by phytoplankton ammonium nitrogen. Furthermore, with the mainland drain to the Gelendzhik bay a large amount of nitrogen and phosphorus compounds arrives, and in its waters a sufficient amount of silicates contains. The increase of nutrients compared to natural concentrations is the reason to the possibility of water eutrophication. In 2009-2011 and in 2014 this led to the predominance of large diatom phytoplankton composition, the bulk of biomass were algae Rhizosolenia calcar-avis (80%). Flagellates were presented Peridinium. Mass flowering of these algae, resistant to pollution, provide an indication of the deterioration of water quality. Determination of the causes and prognosis are the main tasks for the development of measures to restore natural conditions.



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## Innovative Methods Of Seismic Monitoring As A Necessary Part Of The Area Security System

*Svetlana KISHKINA, G. KOCHARYAN (Russian Federation)*

It is well known that earthquakes and other dangerous geodynamic events most likely to occur in tectonically active regions of the Earth's crust. However, in recent years, increasing attention of scientists and the whole community are attracted earthquakes that occur in places that have always been considered tectonically quiet. These events are associated with engineering activity. The huge volumes of solid minerals are extracted from the bowels in the world every year, are constructed large industrial waste disposal, surface and underground engineering structures. Hydrocarbon production is inevitably associated with the injection of fluid into the bowels, which one comparable to the oil volume. There is traditional concern for the preservation of the ecological balance and today it must be supplemented by concern for the geodynamic control and balance. There were strongest earthquakes triggered by anthropogenic activities that had taken place in the area of gas field Gazley (1976,1984); earthquakes also occurred in the development of oil fields "Romashkinskoye" (Tatarstan) thirty years after the start of work; a strong man-made earthquake occurred in the Kuzbass in 2013. Has grown seismicity of central areas of the US due to the development of shale gas. Examples can be continued. We observed such examples in the Vorkuta coal deposit. Dangerous for buildings and structures may be not only sismic waves of high amplitude, but relatively weak vibrations from low magnitude events. In last cases either the vibrations can be trigger or damage can be accumulated during many occurrences. We have analized similar examples for the territory of the Kursk Magnetic Anomaly. In this study we analyzed the experience of applying the method of seismic monitoring with small seismic arrays sites of Civil engineering in the European part of Russia. This research is support by RFBR 13-05-00950



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## Distribution patterns of rainfall and winds episodes in the Metropolitan Region of São Paulo

*Beatriz Barbi de Oliveira SANTOS, Lucí Hidalgo NUNES (Brazil)*

São Paulo, Brazil, the largest city of Southern Hemisphere, is home of 12 million people. Considering the Administrative Region of São Paulo (ARSP), which encompasses more 39 cities, the area concentrates 19.973.125 inhabitants and approximately 18% of the country's GDP (farming, industrial production and the hydroelectric power stations). However, the tropical rainy regime of the region coupled with the high population density, the rapid process of urbanisation and the lack of territorial planning policies have contributed to the growing number of natural disasters in this strategic area, posing a threat of major disruptions to the economy and to the physical and biological processes of the region. The study analyzed records of precipitation, winds and their impacts from 1980 to 2009 in the ARSP, comparing the occurrences classified in a five-year periods, with the aim to evaluate the spatio-temporal distribution of the episodes and the types of damages. Results pointed out São Paulo was the most affected city, with 41% of total of events and more than 30% of the damages reported, and showed that damages occur more frequently in summer and spring, not only because precipitation is more common and intense, but also because this period concentrates more energy, which can be verified by the damages. The intensity, number and types of impacts varied according to the city, but in general floods and property collapses were the more recurrent impacts recorded. The study showed that many individuals were affected, especially in the period between 2005 and 2009, which showed large numbers of displaced, homeless and deaths.



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IGU 2015 – 1939

**The occurrence of extreme hydrological events under the influence of climate variability and long-term response of El Niño**

Maria KIREEVA, D. GUSHINA, N. FROLOVA, D. POZHIDAEVA, I. ZHELEZNOVA (Russian Federation)

Extreme hydrological events on the Russian rivers are closely related to climate change consequences. Such hydrological events are rare in occurrence but typically affect large areas, resulting in damage in several economic sectors. The last one was the disaster flood in Amur river basin in 2013. According to RosHydromet, number of dangerous hydrolometeorogical events doubled from 150-200 in the early 1990s to 350-450 by the end of 2000's. During the last twenty years the role of the occasional floods in water regime became more and more significant. These events are closely connected with an atmospheric circulation in tropical as in the extra tropical latitudes. The main goal of this study is to investigate the long-response of the river runoff on the El Niño phenomenon and its variations according to the climate change. For this analysis the areas of temperature and precipitation response on these phenomena were highlighted. The joint analysis of the occurrence of extreme hydrological events and the El Niño and La Niña phenomenon was carried out. It was found that the remote response comes out mainly for the Far East region, spatially for Amur River basin, rivers of the Okhotsk Sea and the Kamchatka Peninsula. For the first time for Russian rivers relationship between anomalies of global and regional atmospheric circulation with sea surface temperature and extreme hydrological events was analyzed. The study was supported by the Russian foundation for basic research (project № 15-05-06693 A).



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**Indonesia's growing landslide problem: an examination of two disasters in Sijeruk and Tawangmangu, Central Java**

Brent DOBERSTEIN, Judie CUKIER (Canada)

Landslide risks have been growing in recent years in many S.E. Asian countries, including Indonesia. A 2012 report by the Indonesian National Disaster Management Authority (BNPB) stated that over 40 million Indonesians are located in high-risk zones in Java, Sumatra, and Sulawesi, and documented landslide events have increased by 30% in just the last two years (Coca 2015). In many cases, these landslides have not been pinned on any one single 'trigger', with researchers often finding multiple factors (e.g. land use change, deforestation or forest conversion, human settlement location, road building, and/or climate change) working together to create deadly landslide conditions. This research examines the causal mechanisms of two deadly Central Java landslides which occurred during the 'normal' rainy seasons of 2006 and 2007. Interviews (n=10) were conducted in both Sijeruk and Tawangmangu villages with survivors of the deadly events and government officials, and both participant observation and secondary data on both events were used to augment interview data. The research results generally supported the observations of 'multi-causal' landslide disasters seen in other parts of Indonesia, yet interviewees were unanimous in their opinion that the landslides had occurred in the midst of a 'normal' rainy season, so changing precipitation patterns (under a climate change scenario) were not seen as being linked to these disasters. The research concludes with both village-specific and more general observations about landslide disaster risk reduction in high risk areas of Indonesia.



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# C12.19 Health and Environment

## Health and Environment Change 1

**Chairperson(s):** *Thomas KRAFFT*

- Investigating the changes of skin lesions of arsenism patients and their impact factors from an endemic arsenism area

  *Yang LINSHENG, Gao JIANWEI, Wei BINGGAN, Yu JIANGPING, Xia YAJUAN, Wu KEGONG (China)*

- Assessing Health Status In Relation To Ecosystem Services In The Coastal Areas Of Bangladesh

  *Ali AHMED, Mahin Al NAHIAN, Mofizur RAHMAN, Dilruba BEGUM, Sate AHMAD, P K STREATFIELD, Helen ADAMS (Bangladesh)*

- The environmental mechanism on the longevity in China

  *Wuyi WANG, Li YONGHUA, Li HAIRONG, Yu JIANGPING, Yang LINSHENG (China)*

- Urban Contexts in Healthy Ageing and Demographic Change: The example of Luxembourg

  *Bernhard KOEPPEN, Basile CHAIX, Philippe GERBER, Yan KESTENS, Olivier KLEIN, Sylvain KLEIN (Luxembourg)*

## Health and Environment Change 2

**Chairperson(s):** *Mark ROSENBERG*

- Medico-geographical assessment of natural-focal diseases related to touristic activities in Russia

  *S.M. MALKHAZOVA, V.A. MIRONOVA, N.V. SHARTOVA, D.S. ORLOV, P.V. PESTINA (Russian Federation)*

- Temporal and Spatial Variations of Plague Dynamics in Historical Europe: The Role of Climatic and Socio-economic Factors

  *Ricci YUE (China)*

- Challenges in Health Seeking Behavior among Women in Mountainous Terrain, A Case Study of Uttarakhand, Himalayas

  *Anita BHARGAVA (India)*

- Land cover and influence on the hydrophobicity of the soils: a case study from the Brazilian Southeastern region

  *Alexandre DA SILVA, Camila ROQUE, Luara DE SOUZA NASCIMENTO, Maisa DA ALDEA, Marina VIEIRA (Brazil)*



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**Health and Environment Change 3**

**Chairperson(s):** *Wuyi WANG*

- Influence evaluation of abrupt weather changes on exacerbations of chronic non-communicable diseases in the central area of Cuba

  *Elena SEMINA (Russian Federation), Marina TRUBINA (Russian Federation) , Alexandr UGRYUMOV (Russian Federation), Luis B. LECHA ESTELA (Cuba), Elena CARVAJAL CIOMINA (Cuba)*

- Monitoring of meteor-tropic effects: results for the region of Europe

  *Elena SEMINA (Russian Federation), Luis B. LECHA ESTELA (Cuba), Elena CARVAJAL CIOMINA (Cuba), Orlando LUJAN FERNANDEZ (Cuba), Dayro M. GARCIA HERRERA (Cuba)*

- Bioclimatic research of the North-West region

  *Marina TRUBINA (Russian Federation)*

- The links among environmental change and children's health at the regional level

  *Tamara VATLINA (Russian Federation)*

**Health and Health Care 1**

**Chairperson(s):** *Svetlana MALKHAZOVA*

- New Trade Agreements: Challenges for Global Health?

  *Thomas KRAFFT, Christoph ALUTTIS, Eva PILOT (The Netherlands)*

- Accessing MRI Services in Ontario, Canada: Where Theory Meets Practice

  *Mark ROSENBERG, Kathi WILSON (Canada)*

- Health care needs and health care supply in Romania

  *Daniela ZAMFIR, Liliana DUMITRACHE, Gabriel SIMION, Ilinca-Valentina STOICA (Romania)*

- The Evolution Of The Population Health State In The Vatra Dornei Health Resort (Romania)

  *Alexandrina CRUCEANU, Ionel MUNTELE, Gianina Maria COJOC, Alin MIHU-PINTILIE (Romania)*

- Good Practices in European Public Policies to reduce Health Inequities - a multi-level policies review

  *Eva PILOT, Beatrice SCHOLTES, Wang LI, Julia DOETSCH, Kai MICHELSON, Thomas KRAFFT (The Netherlands)*

**Health and Health Care 2**

**Chairperson(s):** *Wuyi WANG*

- Unraveling Romanian Health Professional Emigration: Myth or Reality?



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*Liliana DUMITRACHE, Mariana NAE, Daniela ZAMFIR (Romania)*

- Recent Immigrants' Access to Health Care in Ontario, Canada: Examining the Impact of Health Care Policy

  *Kathi WILSON, M.W. ROSENBERG, Nicole RATTI, Michele COLLEY (Canada)*

- The Evolution Of The Population Health State In The Vatra Dornei Health Resort (Romania)

  *Alexandrina CRUCEANU, Ionel MUNTELE, Gianina Maria COJOC, Alin MIHU-PINTILIE (Romania)*

- Longevity in China: environmental, social-economic and policy perspective

  *Li WANG, Yonghua LI, Jennifer HOLDAWAY, Wuyi WANG; Thomas KRAFFT (The Netherlands)*

**Health and Health Care 3**

**Chairperson(s):** *Thomas KRAFFT*

- Spatial temporal analysis of public health in regions and cities of Russia

  *Natalia SHARTOVA, Svetlana MALKHAZOVA (Russian Federation)*

- Spatial optimization of residential care facility location in Beijing, China

  *Yang CHENG, Zhuolin TAO, Teqi DAI (China (Beijing)); Mark Rosenberg (Canada)*

- Geographical Variations in Utilization of Antenatal Care Services among Urban Women in India: Problems and Prospects

  *Laxmi Kant Prakash PREM, Anuradha BANERJEE (India)*

**Health and Health Care 4**

**Chairperson(s):** *Wuyi WANG*

- Recent Progress in Research on Lifestyle-Related Health Problems in Post-Industrial Countries

  *Eric WEST (United States of America)*

- Immigrant health, socioeconomic factors and residential neighbourhood characteristics: A comparison of multiple ethnic groups in Canada

  *Lu WANG (Canada)*

- Relationship between lifestyle and population health status. Case Study: Ialomita County (Romania)

  *Ana-Maria TALOS (Romania)*

- Inequalities of population's accessibility to health care services. Case study: Botosani County-Romania

  *Teodora URSULICĂ (Romania)*



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## POSTER EXIBITION

### Health and Environment Change

- Residential exposure to drinking water arsenic in Inner Mongolia, China

  *Yajuan XIA, Kegong WU, Zhixiong NING, Yanhong LI, Jun Liu et ALYAJUAN (China)*

- Significant heat waves impacts on the health of Cuban´s population

  *Elena CARVAJAL CIOMINA, Luis B. LECHA ESTELA, Dayro M. GARCIA HERRERA (Cuba)*

- Distribution features of natural foci of some important tropical diseases in the natural environment of Republic of Guinea

  *O.K.KONSTANTINOV, M.Y.BOIRO, S.KALIVOGUI, M.C.BALDE, M.S.DIALLO, N.CONDE (Russian Federation)*

- Complex approaches to the study of type's adaptation of nonresident students to conditions of the metropolis (St. Petersburg)

  *Yana SCORYK, Ekaterina SEMOVA, Marina TRUBINA (Russian Federation)*

- The ecological and geographical factors of the Chechen Republic population's health

  *Halimat ELDAROVA (Russian Federation)*

### Health and Health Care

- Air pollution and oncological morbidity of population of the Ukraine's regions

  *Anatoliy KORNUS, Volodymyr SHYSCHUK, Olesya KORNUS (Ukraine)*

- Medical intersectoral complex

  *Gleb MAMYRKIN (Russian Federation)*



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## Investigating the changes of skin lesions of arsenism patients and their impact factors from an endemic arsenism area

*Yang LINSHENG, Gao JIANWEI, Wei BINGGAN, Yu JIANGPING, Xia YAJUAN, Wu KEGONG (China)*

Arsenic has been identified as a primary human carcinogen. Compared with the other carcinogens, chronic arsenism has unique clinic skin lesions including pigmentation and depigmentation of body, and hyperkeratosis of hands and feet. Skin lesions were hardly recovery and considered to be related with latent carcinogenesis. At present, little is known about the causes impacted on the occurrence and development of skin lesions. In this study, the prevalence of skin lesions caused by exposure to high arsenic groundwater from Inner Mongolia, China, are investigated. It is found that the symptoms of skin lesions are development systematically. Hyperkeratosis emerges in the early stage and has the highest prevalence. The morbidity rate of depigmentation is lower, while the value for pigmentation is lowest. The skin lesion patients who have depigmentation are also suffering from hyperkeratosis. Similarly, hyperkeratosis and depigmentation are also observed in the patients who have pigmentation. The results indicate that the clinic skin lesions are mainly associated with gender, age and exposure duration. Arsenic methylation capacity of the patients who have all the three symptoms has been significantly damaged. Moreover, after cessation of arsenic ingestion from groundwater for 10 years, arsenic concentrations in urine and fingernail of the resident are dramatically decreased. However, the values are still higher than that of the control group. Meanwhile, the arsenic methylation capacity of the resident is obviously increased, although it is still lower compared to the control group. The results of this study provide new evidences for exposure assessment and dose-effects assessment of environmental exposure to arsenic.



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# ASSESSING HEALTH STATUS IN RELATION TO ECOSYSTEM SERVICES IN THE COASTAL AREAS OF BANGLADESH

*Ali AHMED, Mahin Al NAHIAN, Mofizur RAHMAN, Dilruba BEGUM, Sate AHMAD, P K STREATFIELD, Helen ADAMS (Bangladesh)*

The impact of gradually on-setting climate change on health and wellbeing of people is comparatively less recognized. Bangladesh, a country well identified for its vulnerability to climate change associated extremes, is also suffering from ongoing gradual changes in its weather and climate. Though there are researches on estimating the decline of agricultural production from different modeled assumptions, household level food security and food practice in the context of a changing climate are poorly understood. Coastal areas are exclusive zones of both opportunities and vulnerabilities; people's lives, livelihood, food practice and security are thus associated with local ecosystem and environment and prone to climatic impacts. This study, a part of the 'Assessing Health, Livelihoods, Ecosystem Services And Poverty Alleviation In Populous Deltas' project is trying to explore the association among food security, health and well being of different wealth quintiles using systematic approach within the framework of Socio-Ecological Systems (SESs). The seven SESs in the study are defined by major Ecosystem Services (ESs) and dominant livelihood activities. The study area covers south central to south west coastal districts. In this social survey, structured questionnaire has been used for blood pressure and anthropometric measurement (height, weight) as the primary data sources to see the association among food practice, calorie intake and nutritional status of different socio-economic groups with ecosystem services. The study findings are believed to provide important insights on coastal communities' health and nutritional status in relation to ecosystem services that have critical policy implication in line with country's climate change adaptation activities.



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## The environmental mechanism on the longevity in China

*Wuyi WANG, Li YONGHUA, Li HAIRONG, Yu JIANGPING, Yang LINSHENG (China)*

Healthy longevity is associated with environmental and social conditions. By using longevity index (population aged 90+/65+, LI%) and centenarity index (age 100+/ total population, CI%) to evaluate the longevity level in different location in China, it has been found that people aged 90 and above could be more influenced by physical environmental factors. The more centenarians live in south China related to certain climatic preferences including near to the coasts, suitable mean year temperature, plenty of rainfall, higher relative humidity and low mean wind speed, which might contribute to relatively high longevity level. Nevertheless, enrichment of essential nutrients and less pollution in the environment would be benefit for health and longevity.



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## Urban Contexts in Healthy Ageing and Demographic Change: The example of Luxembourg

*Bernhard KOEPPEN, Basile CHAIX, Philippe GERBER, Yan KESTENS, Olivier KLEIN, Sylvain KLEIN (Luxembourg)*

Various studies give strong evidence that social integration, physical activity and mobility are favorable for healthy ageing. With an ageing population as one future challenge for most Western societies, the identification of potential obstacles and barriers to mobility and social activities besame an important task for research and practitioners. Some components of healthy aging including physical activity, social participation or mobility have been linked to dimensions of the built environment, but a more profound understanding. of the processes linking environments to health among older adults is still lacking. The project "Contrasting Urban Contexts in Healthy Ageing" goes beyond the compilation and combination of the results from separate studies, but collects detailed data on daily mobility and health outcomes among older adults in contrasted urban settings in Montreal, Paris and Luxembourg. In Luxembourg, a "classical" quantitative survey dealing with well-being, health, mobility and the perceived environs is combined with the collection of location data and information on physical activity during 7 days with 500 persons aged 65 and older. As this approach does take into consideration demographic characteristics as well as spatial qualities, an innovative, unique and robust strategy for socio-spatial sampling had been developed and applied. The study shoes that serious health issues do affect mobility behavior. Nonetheless, confirmed habits tend to be very stable, thus changes in health or the urban environment must be rather important, before significant changes happen or new individual strategies are developed.



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## Medico-geographical assessment of natural-focal diseases related to touristic activities in Russia

*S.M. MALKHAZOVA, V.A. MIRONOVA, N.V. SHARTOVA, D.S. ORLOV, P.V. PESTINA (Russian Federation)*

Travel, besides being a source of new experiences and cultural enrichment, can be dangerous to the travelers' health. It should be taken into consideration while planning different touristic activities and must be kept in mind when evaluating the region's recreational potential, as well as for improving travel and recreation in the country. Russia, an enormous country almost completely located within temperate latitudes, has a broad spectrum of natural landscapes which attract increasing numbers of tourists. Infectious and parasitic diseases play a leading role among the health problems that tourists face while traveling. Among the multitude of infectious diseases that can endanger travelers, natural-focal diseases, whose agents and/or carriers are integral to natural landscapes, are especially prominent. Recent rapid development of new forms of tourism, such as eco-tourism, ethnographical trips, gastronomical tourism, etc., raises the risk of infection. Some of the results of the study of natural-focal infections and parasitoses, which are necessary to evaluate the recreational and travel potential of the Russian Federation, are presented and discussed in this presentation. A cartographical and statistical analysis of infectious and parasitic natural-focal diseases, spanning more than a decade (1997-2013), is the basis of this study. A series of original analytical, integrated, and synthetic maps showing disease incidence in the population at both the national and regional levels were analyzed to estimate the risk of a disease manifestation in travelers in a given region. The results of this study may be useful both for individual tourists planning trips to Russia and tour agencies organizing tour groups, as well as for health advisers and medical workers.



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# Temporal and Spatial Variations of Plague Dynamics in Historical Europe: The Role of Climatic and Socio-economic Factors

*Ricci YUE (China)*

From the Black Death in the medieval time to SARS in recent history, from Eurasia to Africa and all other continents, infectious diseases remind a threat and burden to public health and the development of mankind. In the face of the accelerating climate change and rapid population movement in the foreseeable future, infectious disease will raise and become an emerging threat to human civilization. Although there has been researches showing that climate conditions and geographical conditions are associated with the transmission dynamics of human plague, these studies did not covered the plague epidemics over an extended period and only covered the Southern part of US and China. The lack of prolonged period of observation in both temporal scale and spatial scale hinder the study of environment-epidemics association. In light of this, we try to investigate the European plague history from 1347 to 1900 to evaluate the outbreak of plague with climatic variation yearly. By using the extensive dataset that includes year and precise location of the outbreaks, the first part of this research will use trend-surface analysis (TSA) to study the spatial pattern of plague diffusion for two waves of plague outbreak in Europe during the Black Death (AD 1347 – AD 1353) and the Thirty Year War (AD 1618 – AD 1648). The second part of the study will adopt statistical method to disaggregate Europe into 0.5° X 0.5° grid cells to identify the explanatory variables leading to the outbreak of plague from 1500 to 1900. This research aims to provide insight on the transmission patterns of human plague under different climatic and geographical variability. By understanding more about the long-term dynamics and the issues and scales for the environment-epidemics association, the risk of epidemics outbreak can be subsided.



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IGU 2015 – 0726

# Challenges in Health Seeking Behavior among Women in Mountainous Terrain, A Case Study of Uttarakhand, Himalayas

*Anita BHARGAVA (India)*

The world is evincing dynamic changes in the natural and social environment. The pattern of health problems is also making a shift from communicable to non communicable diseases. However, the mountainous population in remote villages of India is yet to reach the benchmark of improved health. Though they are more akin to natural environment but their distant location and weaker connectivity leads to loss of lives in absence of proper medical care. Rural women, in particular, face dreadful challenges to overcome reproductive health problems like reproductive morbidity. The paper aims to identify interrelationship between natural environment acting as a barrier and treatment seeking behaviour of women in a Himalayan state, i.e. Uttarakhand considered under the EAG group (Empowered Action Group of states in India). Correlation and cross tabulation analyses with background characteristics have been done to study the gross impact of physical barriers such as distance from health institutions, conditions of roads and availability of transport at the time of need, on health seeking behaviour. The evidence of not seeking health interventions and reliance on traditional medication/herbal remedies are interpreted and supported through content analysis. Thus the paper is an exploration to identify the challenges posed by physical environmental factors on treatment seeking behavior among women and the resultant health outcomes.



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## Land cover and influence on the hydrophobicity of the soils: a case study from the Brazilian Southeastern region

*Alexandre DA SILVA, Camila ROQUE, Luara DE SOUZA NASCIMENTO, Maisa DA ALDEA, Marina VIEIRA (Brazil)*

Because their physical and chemical characteristics, soils have the property to have more or less propensity for water repellency, also known as hydrophobicity. Modifications in land cover usually modify such soil property and this might modify the hydrological and erosion dynamic of a region. Sorocaba (SP state, Brazilian Southeastern region) is an important city that encompasses approximately 630,000 inhabitants, is highly urbanized and the original forest vegetation is highly fragmented. A study has been conducted in order to evaluate the relation among the classes of land cover and soil hydrophobicity. In each one of seventy georeferenced sampling points (sp) scattered along the study site, three soil samples were collected (in a 0-20cm depth), considering the classes of land cover: forest-covered; urbanized regions; grass-covered places; rural, cultivated soils; and bare, uncovered places. In laboratory, the samples were gently dried and sieved (2.00 mm). After, for the fraction <2.00 mm, we checked the time of penetration of a drop of distilled water. In 48.6% of total sp, the penetration of water was immediate (zero seconds, meaning be hydrophilic). Most of these samples were collected from human-altered regions (urban, rural, grass or bare). Conversely, in 8.1% of the samples the time of penetration was longer than 3,600 seconds (meaning highly hydrophobic). Almost all samples with high hyd were from pristine covered forest. The results confirm the potential of land cover change the hydrological properties of the soils, where soils submitted to human alterations tend to be hydrophilic, at least for our region.



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## Influence evaluation of abrupt weather changes on exacerbations of chronic non-communicable diseases in the central area of Cuba

*Elena SEMINA (Russian Federation), Marina TRUBINA (Russian Federation) , Alexandr UGRYUMOV (Russian Federation), Luis B. LECHA ESTELA (Cuba), Elena CARVAJAL CIOMINA (Cuba)*

Background. The climate of Cuba is characterized by low variability of meteorological parameters over the year. However, abrupt weather changes may produce the massive occurrence of meteorotropic responses on human health: the exacerbation of respiratory diseases (bronchial asthma) and vascular diseases (arterial hypertension, migraines, heart and brain-vascular diseases). As part of the Health Watch & Warning System in Cuba, biometeorological forecasts are aimed to prevent the negative weather impacts on human health of the local population. However, new methodological approaches to scientific research are necessary to increase the efficiency of such forecasts. Objective. The basic aim of this study was to determine spatial and temporal patterns of distribution of biometeorological indicators and bioclimatic features for the central regions of Cuba, as well as to identify the main trigger mechanisms of meteorotropic responses. Methods. Meteorological data, obtained from the database of National Meteorological Institute of the Republic of Cuba, underwent the following evaluations: biometeorological indexes were calculated. The index selection criteria was based on biometeorological techniques of Ovcharova V.F., Lecha L., Povolotskaya N.P. et al. Acute chronic non-communicable diseases daily exacerbations were evaluated. Statistical treatment methods and computer programs Excel, Statistica, GIS Arc View were used. Results. Analysis of the weather type classification, taking into account synoptic situations, was carried out. The cross-correlation analysis of the relationship between weather types and exacerbations of chronic non-communicable diseases was carried out as well. The automated biometeorological forecast preparation system was developed. Conclusion. The concept of creating an Objective Biometeorological System, for increase of efficiency of specialized biometeorological forecasts, was developed. Keyword(s): weather impacts; human health; biometeorological forecasts



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## Monitoring of meteor-tropic effects: results for the region of Europe

*Elena SEMINA (Russian Federation), Luis B. LECHA ESTELA (Cuba), Elena CARVAJAL CIOMINA (Cuba), Orlando LUJAN FERNANDEZ (Cuba), Dayro M. GARCIA HERRERA (Cuba)*

At the end of the XX century Lecha and Delgado (1996) developed a method of biometeorological forecasts for Cuba, supported on the observed relationship between the occurrence of abrupt weather changes and the increase of the daily number of attentions by some chronic illnesses in the medical emergency services of the cities of Havana, Santa Clara and Sagua la Grande. The biometeorological forecasts are operational by means of the PronBiomet model, necessary to calculate the differences in 24 hours of the partial oxygen density of the air (PODA index), starting from the Global Forecast System objective forecasts of the atmospheric pressure at the sea level, the surface temperature and humidity of the air available on-line from (http://nomads.ncep.noaa.gov/cgi-bin/filter_gfs_hd.pl). The emission of biometeorological forecasts to the Cuban health institutions began experimentally in May of 2007 and their content underwent national validation during 3 years (2007-2009). Later on applications were made in Brazil (2010), Spain (2011) and Mexico (2012-2013), being obtained satisfactory results in all cases. The official service to the health institutions of Villa Clara province began in February of 2012 and so far, the 70 emitted forecasts have had acceptance inside the medical community and a good operational performance, given appropriately informative watches, warnings or alerts to the health system before the occurrence of significant meteor-tropic effects among the local population. However, the effectiveness has shown different success levels according to the illness: for the increases of bronchial asthma crises (97%), in the hypertensive crises (88%), with the brain-vascular illnesses (85%), the migraines (82%) and they were acceptable in the case of the cardiovascular diseases (75%). That is to say, with 3 successes every 4 emitted forecasts. The practical implementation of the service from the medical counterpart allowed the design and implementation of new procedures for the surveillance and treatment of the meteor-pathological reactions that occurs in the population, associated to abrupt weather changes or to the presence of other adverse environmental conditions. The procedures of surveillance and treatment of the arterial hypertension and the bronchial asthma attentions at Emergencies are already working, and they are in development new procedures for the attentions of medical urgencies due to brain-vascular and cardiovascular diseases. From the year 2008 the application of the model PronBiomet was extended to the regions of North America and the Caribbean, South America, Europe and oriental Asia, as well as personalized applications were programmed for isolated countries as Australia, New Zealand, Spain and Mexico, besides Cuba that also has a high



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resolution version of the model. It allowed developing the daily & global monitoring of the more significant meteor-tropic effects, using in all the cases the normalized scale of the PODA index like the main reference biometeorological indicator for analysis and comparisons among regions and populations. The monitoring of meteor-tropic effects is expressed in synoptic-statistical terms by means of the mean number of days with contrasting and very contrasting weather changes in boxes of 5 X 5 degrees of latitude and longitude, containing each one of them: 121 nodes of data obtained from the GFS database with a space resolution of 0.5 degree. The workspace for Europe extends from the 10°N up to 70°N and from the 20°W up to 25°E, with a total of 11,010 nodes with information of the atmospheric pressure reduced at the mean sea level, the surface temperature and humidity of the air, variables needed to calculate the partial oxygen density of the air and its differences in 24 hours (the PODA index) for each node of the region and every day during the period from January of 2008 until December of 2014. The monitoring results indicate that it was happened a very remarkable increase of abrupt weather contrasts frequency during the last two years in a wide geographical area that extends from the northwest of Russia until the Black Sea. A clear regional difference exists in the spatial patterns of occurrence of abrupt weather contrasts, corresponding to the increase of the PODA index (hyperoxia sensations) most of the extreme contrasts in the northern part of Europe; while in the southern part a decrease of the PODA index prevails (hypoxia sensations) such as the cause of occurrence of severe weather and the more outstanding meteor-tropic effects. From the point of view of their genesis, the hyperoxia sensations are related with the influence of the polar air masses and the hypoxia sensations are in correspondence with the frequent influence of intense extratropical cyclones, that coming from the Atlantic through England and the western half of the continent. The maximum nuclei of inter-daily weather contrasts are located and they displace, according to the season of the year, following the behavior of the main synoptic patterns, reaching in the winter quarter (December-February) their maximum decline to the south and in the summer quarter (June-August) their maximum northern decline. However, the behavior and influence of the Atlantic subtropical anticyclone on southwest Europe and the influence of other significant meteorological processes from Africa, such as the arrival of Saharian dust, determines the highest or smaller occurrence of inter-daily weather contrasts able to produce significant meteor-tropics effects. The increment of meteor-tropic impacts associated to intense winter storms and severe weather in the region during the recent winters coincides with the remarkable increase of winter cyclones affecting North America, especially the United States. Although a "polar vortex" was not observed in Europe, the general increase of the unbalance of energy in the whole climate system favored the occurrence of significant weather phenomena and biometeorological contrasts in the region. Such evidences may be early signals of a new global very meteor-tropic pattern of the general circulation of the atmosphere, that it would be consequence of the increasing unbalance of mass and energy through latitudes, derived from an increase, already physically perceptible, of the temperature of the whole climate system.



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# Bioclimatic research of the North-West region

*Marina TRUBINA (Russian Federation)*

Introduction. The Strategy of development Russian Hydrometeorological Service, contains the range of actual research programs, including adaptation of the population to to climate change. Processes of adaptation of the person to various climatic conditions depend both on a condition of its health, and from climatic features of regions of residing. The analysis of known methods of an estimation of comfort of the climate, applied in complex climatology and balneology, allows to select such optimum parameters and indicators which characterize degree meteopathy of the person, and to use them for a bioclimatic estimation of comfort of a climate. Methods and materials. Biometeorological researches show that in order to make a complete description of the atmospheric medium influencing the human organism, it is necessary to take into account such meteorological factors as temperature, air humidity, atmospheric pressure, wind characteristics, solar radiation fluxes, precipitation, atmospheric electricity, atmospheric radioactivity, subsonic noise, density of oxygen in the air. For assessment of the bioweather conditions, used are diverse weather classifications and biometeorological parameters (indices). The biometeorological parameters include two or more meteorological factors. The author done a classification and ranking of the known complex biometeorological indicators (BMP), including a calculation of the basic meteorological parameters. On the basis of content analysis were selected 28 biometeorological indicators / indices that are used in domestic and foreign practices, which were then separated in seven groups (categories); with the criterion group was a core set of available meteorological parameters. For the selection of optimal index survey was conducted of opinions of 30 experts of different areas of knowledge. As a result, the selection of the most informative indices for the calculation of which was developed by software module. The calculations performed on these indices are to bioclimatic evaluation of the region. Also used for assessment data of climate resources and bioclimatic resources. Was calculated bioclimatic potential of some cities of the North-West region of Russia. Results. Based on multivariate approach was conducted an integrated assessment, which resulted in the detected seasonal bioclimatic and medical and climatic features of the territory. Bioclimatic mapping of the region allowed determining zones for comfortable and uncomfortable for the populations of individual cities in the Northwest. The results of the investigation can be used to create a medical-geographical atlas of the region, allow us to choose the regions which are most favorable for organization of health resort treatment and recreation. The author done recommendations for prophylaxis of meteopathic reactions of a human organism.



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## The links among environmental change and children's health at the regional level

*Tamara VATLINA (Russian Federation)*

Water content of the landscape and water supply of the population is an important environmental factor. Lack of drinking-water may have a limiting ecological sense, that is, may be the main obstacle for a settlement and development of the landscape. The quality of drinking water is the most important component of population health and one of the general criteria for the quality of life of the population. 80% of the Smolensk region population consumes for drinking the underground drinking-water relating to the Moscow artesian basin. Within the region are tectonic faults which cause entry into aquifers strontium, increases the salinity, hardness. A similar situation is observed in many regions of the Central Federal District, the share of underground waters that do not meet regulatory requirements, is constantly increasing. The quality of undergroundwater on the Smolensk region territory has a number of features. Most common are deflectionsfrom rigidity, iron, manganese, fluorine, strontium. These deviations have the natural origin and related to the composition of the rocks aquifers. About 80% of undergroundwater is taken by water intake sites, located within the boundaries of a residential or industrial building cities in the region, that is, in terms of increased risk of undergroundwater contamination from the accommodation facilities of industrial activity, where technogenic pollution is possible. At the same time it should be noted that most of the undergroundwater is used for drinking purposes in the territory of the Smolensk region at a depth of 60–80 m and more, making their quality in respect to sanitary. In general, for all centralized urban water intakes in the region is characterized by steady growth indicators such as the state of underground water hardness, salinity, iron, manganese, fluoride, strontium, selenium sulfide. The main reason for the decline of undergroundwater quality is to change the hydrodynamic state of undergroundwater due to a long and strong exploitation that led to tightening in the target horizons substandard treatment of underlying aquifers. Increased mineralization, total hardness, iron and manganese, strontium sulfide is typical for underground waters of the target horizons within the major industrial centers with a large water intake. The water used by the population for drinking purposes, is a group of leading factors affecting public health. Among the pathologies associated with the quality of drinking water, are diseases of the genitourinary, cardiovascular, endocrine, musculoskeletal and nervous systems, as well as diseases of the skin and subcutaneous tissue. Effect of increased hardness on the development of diseases of the urogenital system described in some studies. The paper considers the impact of the increased rigidity of undergroundwater for diseases of the genitourinary system is most sensitive age group of the population – children. The incidence of child population – a representative group of the indicator, which reflects the more pronounced the effect of the water factor. This is due to the fact that children are less prone to migration, do not feel the impact of hazards associated with work. In addition, due to the anatomical and physiological characteristics of children are more sensitive to the quality of the environment, and the



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timing of the adverse effects they are shorter. This increases the accuracy of the detection of environmental-related diseases. To analyze the impact of the chemical composition of drinking water was considered the incidence of children's diseases of the genitourinary system for 1999–2014 years. In order to identify the most advantaged and disadvantaged areas the incidence of child diseases of the genitourinary system were used typological division of the region. To analyze the impact of the chemical composition of drinking water was considered the incidence of children's diseases of the genitourinary system for 1999–2014 years. In order to identify the most advantaged and disadvantaged areas the incidence of child diseases of the genitourinary system were used typological division of the region. Health assessment conducted with the help of the typology districts based on the methodology developed by V.S.Tikunov where all the real parts of the region compared with the theoretical value of the incidence of the best – zero. Such a classification allows to identify territorial dynamics and patterns of study not individual rows, and their groups, which are less prone to accidental deviations. In the first stage of calculations performed baseline normalization of the dispersion and the expectations of all the administrative districts of the Smolensk region. The procedure implemented multivariate typology based on the criterion of minimizing the differences in the allocation of intra different number of groups. As a measure of the similarity of a range of indicators used Euclidean distance calculation which was preceded by the step of processing the array data by the method of principal components. As a result of the automatic classification for the calculation of the incidence of respiratory diseases and urinary tract in children has turned out a series of options with different numbers of types, ranging from 1 to 9. As a final outcome of each variety of diseases using special factors of heterogeneity, choosing the most homogeneous group. For comparability of final results of the calculations were taken from the five groups. The subsequent comparison of the results with the values of the stiffness of undergroundwater reveals statistically significant dependence considered indicators. In areas with the highest exceedance of MACs for water hardness have high morbidity. To analyze the impact of the chemical composition of drinking water was also examined the incidence of children diseases of the skin and subcutaneous tissue for the 1999–2014 biennium. In order to identify the most advantaged and disadvantaged areas the incidence of child diseases of the skin and subcutaneous tissue were used typological division of the region as described above. As a result of the automatic classification for the calculation of the incidence of respiratory diseases and urinary tract in children has turned out a series of options with different numbers of types, ranging from 1 to 9. As a final outcome of each variety of diseases using special factors of heterogeneity, choosing the most homogeneous group. For comparability of final results of the calculations were taken from the five groups. The subsequent comparison of the results with the values of the iron content in the undergroundwater reveals statistically significant dependence considered indicators. In areas with the highest exceedance of MACs for water hardness have high morbidity. Carried out by the method of rank correlation score depending on the incidence of hydro-geochemical characteristics of the 1999–2014 found statistically significant relationships. It is possible to distinguish the territory of the adverse influence of water factor. The analysis describes one of the aspects that reflect the relationship between human health and environmental influences, and can become one of the links for further medical and geographical research within the Smolensk region.



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## New Trade Agreements: Challenges for Global Health?

*Thomas KRAFFT, Christoph ALUTTIS, Eva PILOT (The Netherlands)*

The plans for new comprehensive trade agreements have raised questions about the potential global health implications. In the debate on the current negotiations on far reaching trade agreements (CETA, TTIP, TPP etc.) concerns are expressed regarding (a) a possible roll back of health protection provided by accomplished standards and legislations and (b) the impact on the future development of standards and regulations. The concepts envisaged for a regulatory cooperation under the trade agreements could have a far-reaching impact on global health. The trade agreements aim for harmonizing of regulations and reduction of trade barriers that result from non-tariff or technical regulations. Regulatory coherence should be achieved through the introduction of an institutional framework that oversees the development and implementation of relevant legislation in the signatory states. Stakeholders will have the right to appeal to these regulatory institutions if they fear potential trade impacts from planned regulatory or legislative initiatives. ISDS (Investor state dispute settlement) instruments that are intended to provide effective investor protection under the trade agreements can have considerable impacts on health related policies also with non-signatory states. The dispute on the precautionary principle is one example for future challenges related to the trade agreements. While one side argues that the precautionary principle answers to public "Angst" rather than to sound science, the other side sees a need in the public interest to regulate activities with likely but still uncertain, unproven or disputed risks. The paper discusses the consequences for the international Global Health agenda.



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**Accessing MRI Services in Ontario, Canada: Where Theory Meets Practice**

*Mark ROSENBERG, Kathi WILSON (Canada)*

The Government of Ontario has made reducing wait times for magnetic resonance imaging (MRI) services a priority as part of its Ontario Wait Times Strategy. The goal of the strategy is to reduce wait times for non-emergency MRI services to no more than 28 days across the province regardless of where people live. In its own words, the goal of the Government of Ontario is to "create a system of accountability through transparent reporting of wait time information." To achieve this goal, a web site was created by the Government of Ontario which allows anyone to check the wait times of public hospitals nearest to them or indeed any public hospital which provides MRI services. "Accountability" and "transparency" are theoretical concepts laden with normative values. Reducing wait times to no more than 28 days is a practical goal which implies a theory of equity. The purpose of this paper is to examine critically how theory and practice are not what they appear to be through an analysis of where MRI services are located in Ontario and the failure of most hospitals to achieve the wait time target of no more than 28 days. The paper is part of a larger project on accessing MRI services in Ontario and speaks to a key question of how social justice is defined in theory and practice in health geography.



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## Health care needs and health care supply in Romania

*Daniela ZAMFIR, Liliana DUMITRACHE, Gabriel SIMION, Ilinca-Valentina STOICA (Romania)*

Despite the sustained efforts to reform the health system for over 20 years (a quarter of a century), Romania is facing serious problems in satisfying population health care needs, chronic underfunding of public health units, shortage of medical personnel, lack of GP in rural areas, being frequently mentioned. The economic crisis accentuates these problems making more difficult the access to healthcare of disadvantaged or vulnerable groups. Poor health status of the Romanian population, demographic aging especially in rural areas and high incidences of chronic diseases increases the need for health services and also healthcare costs. Although private health services have had a an extraordinary development in recent years, trying to compensate in some way the gaps in the public sector, they are restrictive for most of the population due to high costs, but also due to geographical location, these being concentrated mainly in large cities. This study examines the distribution of healthcare units and health care professionals, highlighting the deep territorial discordances between the supply and the needs for health care services and even deeper divide between the rural and urban areas from this point of view, with important economic and social consequences further contributing to the deterioration of population health.



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## The Evolution Of The Population Health State In The Vatra Dornei Health Resort (Romania)

*Alexandrina CRUCEANU, Ionel MUNTELE, Gianina Maria COJOC, Alin MIHU-PINTILIE (Romania)*

The health resort Vatra Dornei is situated from the physico-geogarphical point of view in Dornelor Depression (near 800 m), surrounded by Suhard Mountains, Bargaului Mountains, Bistritei Mountains and Calimani mountains, and from the administrative point of view, in Suceava County (the north-east of Romania). Regarding the presence of the chronic disease, between 2008 - 2014 there has been noticed a high incidence of certain conditions, such as: hyper blood pressure, chronic obstructive broncho/pneumonia, diabetes, goiter, cirrhosis and hepatitis and less articulatory rheumatism, vasculary affections, ulcer, anaemia, etc. If until recently Vatra Dornei has been associated to rheumatismal affections, the fact was not because of the high incidence of disease in the area but rather because of the therapeutic practices used in the treatment bases in prophylactic and curative sense and of course because of the social and cultural stereotypes related to the resorts in general and the affections treated here, especially. From the total number of infectious disease registered for Vatra Dornei health resort it can be observed a high incidence of affections, such as: respiratory virosis, infectious pneumonia, chickenpox, angiopathy, digestive problems and, in a very small measure, infectious meningitis, dermatosis, scarlet fever, toxoplasmosis, encephalitis, etc. The most dominant affections are the respiratory and digestive ones, a consequence of both climatic factors (for the first type of affections) and a diet rich in animal proteins, it seems (for the second category of affections)



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## Good Practices in European Public Policies to reduce Health Inequities - a multi-level policies review

Eva PILOT, Beatrice SCHOLTES, Wang LI, Julia DOETSCH, Kai MICHELSON, Thomas KRAFFT
(The Netherlands)

This presentation will provide first results of the European research project EURO-HEALTHY. The objective of this project is to improve knowledge and evidence regarding the combination of policies set at European-, member state-and regional level which have been implemented with the aim to improve health and tackle health inequalities across the European region. Furthermore, the stud intends to identify good and best practise of policies tackling health inequalities and the effectiveness. The instrument used for the study is a systematic review of multi-level policies (including interventions and regulations) to promote health and tackle health inequalities. The content of the systematic review is to identify and review targeted health and non-health related policies (including social and health intervention) to tackle inequalities in health based on a meta-analysis, and including policies set at different decision-making levels.



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## Unraveling Romanian Health Professional Emigration: Myth or Reality?

Liliana DUMITRACHE, Mariana NAE, Daniela ZAMFIR (Romania)

The paper presents a critical analysis of Romanian health professionals emigration, presented as an alarming fact by the media and the health authorities but without having the precise dimension of the phenomenon, various institutions presenting contradictory data, referring especially to the potential migration. Although the push and pull factors are well known, actually, there are not concrete studies to reveal the consequences of doctors emigration at health units levels The shortage of medical personnel is a reality faced mostly by public health units, however, is still not proven that it should be directly related to emigration. What is the profile of Romanian emigrant doctor? Are they renowned professionals or young graduates seeking better opportunities for career development, which has not found an acceptable employment in Romania, and therefore fits into the general trend? Paradoxically, the number of physicians has increased in recent years, and Romania does not impose any limit regarding the students' enrollment in medical schools. Although the number of doctors is lower than in other European Union countries, actually there are no studies to assess the physician workforce and the necessary to cover the needs for care, larger issues representing their inequitable geographic distribution than number. Also, it is not evident whether Romanian doctors emigration is compensated by immigration or return migration, although media report occasionally such cases and representatives of major private hospital chains asserts that emigration is a myth, Romanian physicians are directing rather towards the private sector than abroad.



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## Recent Immigrants' Access to Health Care in Ontario, Canada: Examining the Impact of Health Care Policy

Kathi WILSON, M.W. ROSENBERG, Nicole RATTI, Michele COLLEY (Canada)

Immigrants comprise approximately 20 percent of Canada's total population. The self-selection process and medical screening of potential migrants have been identified as key factors explaining the observation that recent immigrants have better health than their Canadian-born counterparts. Despite the apparent health advantage of recently arrived immigrants, research has shown that with increasing length of time in Canada, the health status of immigrants declines to levels on par with and in some cases worse than the Canadian population. The reasons for this are not clear, but it is hypothesized that the decline might be related, in part, to poor access to health care services. Despite the existence of universal health care in Canada, three provinces, British Columbia, Ontario, and Quebec impose a three-month wait period for landed immigrants before they are able to access provincial health insurance. A lack of access to provincially insured health care services within the first three months of arrival may result in immigrants delaying and/or avoiding seeking care, which in turn, may have important longer-term health implications. The goal of the research is to examine the impact of the three-month wait on health status and access to health care services among recent immigrants living in the Greater Toronto Area. Interviews conducted with over 30 recent immigrants revealed that a majority of the participants delayed receiving health care due to the financial reasons. In addition, participants reported both perceived and actual health impacts of the three-month wait on their lives and the lives of their family members.



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IGU 2015 – 4075

## The Evolution Of The Population Health State In The Vatra Dornei Health Resort (Romania)

Alexandrina CRUCEANU, Ionel MUNTELE, Gianina Maria COJOC, Alin MIHU-PINTILIE (Romania)

*The health resort Vatra Dornei is situated from the physico-geogarphical point of view in Dornelor Depression (near 800 m), surrounded by Suhard Mountains, Bargaului Mountains, Bistritei Mountains and Calimani mountains, and from the administrative point of view, in Suceava County (the north-east of Romania). Regarding the presence of the chronic disease, between 2008 - 2014 there has been noticed a high incidence of certain conditions, such as: hyper blood pressure, chronic obstructive broncho/pneumonia, diabetes, goiter, cirrhosis and hepatitis and less articulatory rheumatism, vasculary affections, ulcer, anaemia, etc. If until recently Vatra Dornei has been associated to rheumatismal affections, the fact was not because of the high incidence of disease in the area but rather because of the therapeutic practices used in the treatment bases in prophylactic and curative sense and of course because of the social and cultural stereotypes related to the resorts in general and the affections treated here, especially. From the total number of infectious disease registered for Vatra Dornei health resort it can be observed a high incidence of affections, such as: respiratory virosis, infectious pneumonia, chickenpox, angiopathy, digestive problems and, in a very small measure, infectious meningitis, dermatosis, scarlet fever, toxoplasmosis, encephalitis, etc. The most dominant affections are the respiratory and digestive ones, a consequence of both climatic factors (for the first type of affections) and a diet rich in animal proteins, it seems (for the second category of affections)*



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## Longevity in China: environmental, social-economic and policy perspective

Li WANG, Yonghua LI, Jennifer HOLDAWAY, Wuyi WANG; Thomas KRAFFT (The Netherlands)

Aging is one of the most serious challenges to public health and the social system in China, that can be attributed to the unique phenomenon of "birth control", post-reform and opening up economic and baby boomers during the last century before in China. Aging society in one way causes social-economic challenge and in another way, it is an indicator of a healthy-development with positive social, environment, and economic conditions. Those related social challenges and burdens can be largely mitigated by a "healthy aging". This paper discusses the roles of natural environmental factors, socioeconomic conditions, lifestyles and social policy in contributing to longevity in China, comparing its prevalence across regions. The results indicate that longevity is more common in regions with higher socio-economic development and that have a good natural environment, in particular a mild climate and a soil rich in trace elements. Lifestyle factors, such as sufficient sleep, positive mental state and a light diet were also found to be beneficial. From a social perspective, although China has recently introduced many elder care strategies/policies, regionally inequality and lack of full coverage are still impediments to successfully care for the elderly. Currently family care remains the major form of support. Subsidies and special healthcare services exist but need to be implemented more effectively and in a more targeted way in order to support more successful aging. The paper concludes with a reflection of the consequences for current policies.



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## Spatial temporal analysis of public health in regions and cities of Russia

Natalia SHARTOVA, Svetlana MALKHAZOVA *(*Russian Federation*)*

Human mortality is considered as one of the key indicators of public health and sustainable development of the region. The comparative spatiotemporal analysis of urban population death rate for the 1998-2012 is carried out for 83 administrative units and 120 largest cities of the country. To assess public health in Russia the special techniques have been elaborated. The methods include those which help to identify its spatial and temporary interaction. A basic phase of study was math-cartographic modeling of medical demographic indicators. The technology provides for all stages of compiling and use of computer created maps and map series. It is identified, that the death rate in Russia has a negative trend to change for the period analyzed. There are significant differences in mortality among men and women due to historical reasons as well as impact on public health of modern socio-economic and environmental factors. The death rate among men (14.4 per 1,000 persons) is higher than among women (11.9 per 1,000 persons) practically by each of the analyzed cause of death. The most unfavorable situation in almost all causes of death emerged in the Far East and Southern Siberia. The European territory of Russia has the lowest death rate. The more favorable situation in terms of mortality is in the cities. The exceptions are small industrial cities, where the death rate in most of causes reaches high values. Life expectancy of the population as an integral component of public health is highest in the regions of the North Caucasus (70.5 – males; 78.1 – females) and northern oil extraction region Khanty-Mansiysk autonomous district (67.1 and 76.8). In general, the difference between life expectancy in regions of Russia can vary up to 20 years.



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## Spatial optimization of residential care facility location in Beijing, China

Yang CHENG, Zhuolin TAO, Teqi DAI (China (Beijing)); Mark Rosenberg (Canada)

Background: The residential care system is rapidly developing and plays an increasingly important role in care for the elderly in Beijing. A noticeable disparity in the accessibility to existing residential care facilities, however, is demonstrated in existing studies. The spatial optimization of residential care facility (RCF) locations is urgently needed to promote equal access to residential care resources among the elderly population. Methods: A two-step floating catchment area method with an additional distance-decay function is adopted to measure accessibility to residential care facilities. The spatial optimization model is developed to maximize equity in accessibility by minimizing the total square difference between the accessibility score of each demand location and the weighted average accessibility score. The Particle Swarm Optimization (PSO) method is implemented for the solution. Results: The optimized RCF layouts improve equal spatial access to residential care resources with very low accessibility standard variation (0.0066). A relatively large number of beds (51% of the total beds) to be located in the suburban districts between the central and periphery districts of Beijing are optimized. A smaller number of beds to be located in the central and periphery districts (33% and 16% respectively) are optimized. The gaps between the existing and optimized layouts suggest that more RCF beds (5961 beds) are needed in suburban districts, while the RCF beds in some subdistricts located in the central and periphery districts are oversupplied (5253 and 1584 surplus beds respectively). Conclusions: The optimized results correspond to the municipal special plan proposed by the Beijing government. The optimization objective of this study is different from traditional facility location optimization models, and the method is efficient in maximizing equal access to residential care facilities. This method can support knowledge-based policy-making and planning of residential care facilities.



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## Geographical Variations in Utilization of Antenatal Care Services among Urban Women in India: Problems and Prospects

Laxmi Kant Prakash PREM, Anuradha BANERJEE (India)

Antenatal care services provide a package of health care interventions to the pregnant women that improve not only maternal and child health but also controls preterm births, stillbirths, early neonatal, neonatal and maternal mortality. The present paper is an endeavor to ascertain the variations in access and utilization of Antenatal care services by urban women across geographical space in India. An attempt has also been placed to unearth the determinants of such spatial inequalities by an investigation of the underlying causes. The paper is based on secondary data from the 'Census of India 2011, and District Level Health Survey' (DLHS-III) (2008-09). Statistical analysis likes cross tabulations and logistic regressions have been computed to address the objectives. In addition, thematic mapping has been also done with the help of Arc GIS technique. It is found that ANC services has been utilized more in Goa, Madhya Pradesh, Tamil Nadu, Haryana, Mizoram, Rajasthan, Manipur, Andhra Pradesh, Uttar Pradesh, Punjab and others states whereas, Sikkim, Himachal, Tripura, Jammu and Kashmir, Meghalaya, Odisha, Assam and other states experience low utilization of ANC in urban areas. Younger mothers, low birth order, still birth, spontaneous abortion, education, wealth index, caste, religion, are important factors that influence the utilization of ANC among urban women in India. Therefore, interventions should address younger age groups; poor, uneducated or less educated women in urban areas. Socially deprived scheduled castes, tribes and minority population groups should also be brought under consideration in the maternal health policy. Key Words - Antenatal Care, Empowerment, Wealth Index, Scheduled Caste, Abortions



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**Recent Progress in Research on Lifestyle-Related Health Problems in Post-Industrial Countries**

Eric WEST (United States of America)

Hypokinetic diseases, which are associated with inadequate physical activity or movement and include cardiovascular disease, type two diabetes, and obesity, increasingly affect post-industrial countries. Disorders related to sedentary lifestyles are particularly onerous to quality of life, because they limit the number of active, productive years an otherwise healthy person might enjoy. Recent work by various scholars considers the effects of environmental influences, particularly relating to spatial behavior and movement, on health and fitness. Notably, many of these scholars are not geographers but nonetheless either implicitly or explicitly rely on or apply geographic concepts in work on topics such as everyday movement through built environments, differences in health and diet between residents of rural and urban areas, and differences in health status and beliefs between immigrant and non-immigrant populations. This work surveys recent contributions to the literature, predominantly by non-geographers, on risks to health of sedentary lifestyles in post-industrial countries, focusing on geographic components of this literature. It synthesizes the contributions of that literature and highlights spatial and geographic thinking by non-geographers. This work concludes by suggesting a conceptual framework which geographers might consider, drawing on insights from behavioral geography, in order to build on the findings of the surveyed literature.



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**Immigrant health, socioeconomic factors and residential neighbourhood characteristics: A comparison of multiple ethnic groups in Canada**

Lu WANG (Canada)

Immigrant and minority health is a topic of critical importance both within the Canadian public policy realm and in the social science research contributed by many applied health geographers. Set within the social-determinants-of-health framework, the paper explores the relationships among individual socioeconomic status, residential neighbourhood characteristics and self-reported health for multiple immigrant groups in Canada. It examines health outcomes and health-care use among the foreign-born that are heterogeneous in country of origin. Comparison is made between the overall foreign-born that are highly culturally heterogeneous and native-born populations and among selected recent (Chinese and South Asian) and long-standing immigrant groups (Italian and Portuguese). Data are drawn from the raw microdata file of pooled 2005–10 Canadian Community Health Survey. Descriptive statistics and bootstrap-based Z-test reveal patterns of health outcomes (self-reported health, selected chronic diseases) and use of health services as well as individual and neighbourhood characteristics among the foreign-born and selected immigrant groups, compared to the native-born population. Further, logistic regression is used to identify key determinants of self-reported health for each group. Both individual socioeconomic and lifestyle factors and neighbourhood effects (material deprivation and ethnic density) are examined in logistic regression. Chow test indicates significant differences in the set of health predictors among the models for different study populations. The study adds to the literature on immigrant health by revealing heterogeneity in health within the broadly labelled foreign-born population and by simultaneously considering individual and neighbourhood characteristics in a determinants-of-health framework. It offers important insights on group differences and commonalities in understanding immigrant integration and resettlement in the domain of health.

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**Relationship between lifestyle and population health status. Case Study: Ialomita County (Romania)**

Ana-Maria TALOS (Romania)

Romania has a precarious health status, comparing to other European countries, as a result of the influence of various determinants, including lifestyle, economic status and social environment. The main objective of the present study is to reveal the territorial differences in population health status in relationship with population lifestyle, trying to demonstrate that various components of lifestyle are influencing health indicators. The study area is Ialomița county, located in a plain region of SE part of Romania, being characterized by precarious population health status compared to other Romanian counties. The study was based on statistical analysis, spatial analysis and health survey. The territorial differences in health status have been analyzed using a complex aggregated indicator (health index) resulting from aggregation and standardization of health indicators (mortality rate, infant mortality rate, specific mortality rate and specific morbidity rate). Lifestyle resulted from health survey, applied in four sample localities, by analyzing variables such as nutrition, stress level, physical activity, unhealthy behaviors, and medical behaviors). The outcomes have been processed using the programs SPSS 21 and Quantum GIS 2.2. Preliminary results point out a significant influence of lifestyle on health status of various groups of population, components such as nutrition, unhealthy habits (alcohol consumption or smoking) could explain the existing differences in their health status while variables such as age, gender, income and education have a moderating role. Lifestyle is an important determinant of health status in Ialomița county, which explains the existing differences in health status of the analyzed groups, but also the territorial differences.



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## Inequalities of population's accessibility to health care services. Case study: Botosani County-Romania

Teodora URSULICĂ (Romania)

The accessibility to health services is a major concern of the Ministry of Health in Romania, for which the major objective in Romania is to improve the access to health services, especially for the rural population. The inequalities in the distribution of health resources in the country and particularly in Botosani County, show a different accessibility to health services, depending on the living environment, but also on some financial, educational and social aspects. The population's access to health care services is conditioned on the offer of medical services, which, being unevenly distributed in the country and in Botosani County determines a limited access of the population, especially in rural areas. This paper focuses on the accounting and interpretation of the population's accessibility indicators to health services in Botosani, in the period 2000-2013, in order to highlight the inequalities outlined in the county between the two areas of life. The methodology of research work consists in collecting statistical data from existing statistical online databases, and provided by the Public Health Department Botosani, which were analyzed, processed (merged, grouped, aggregated) and converted into relevant indices to highlight the spatial and temporal dynamics of the population's accessibility to Botosani county's health resources (the health services index), to highlight the dependence of the population on health services (the health needs index) and the population's accessibility to health resources (spatial and temporal accessibility indicators). The calculated indicators were mapped using GIS software, to emphasize spatial inequalities in Botosani County. The spatial distribution analysis of health services index, shows that the rural Botosani County is poorly covered by health services, compared to the urban area, causing a limited access of rural population to health services. The health needs index also shows that the population's dependence on health services is higher in rural areas and lower in urban areas. This outlines an inverse relationship between the two indices: the higher the health needs are the poorer the health services. The spatial accessibility of public health services was analyzed taking into account the average distance, that the patient has to cover up to the nearest medical unit (family doctor's office, hospital, permanent center) and the temporal accessibility according to the time, that the patient needs in order to cover the distance to the nearest medical unit, which depends on the type of transport that the patient has available. The outlined inequalities in people's access to health services have serious consequences on the health of population from Botosani County.



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IGU 2015 – 1609

## Residential exposure to drinking water arsenic in Inner Mongolia, China

Yajuan XIA, Kegong WU, Zhixiong NING, Yanhong LI, Jun Liu et ALYAJUAN (China)

In the Bayannuor region of Inner Mongolia, China, a high prevalence of chronic arsenism has been reported in earlier studies. A survey of the water supply system was conducted in 1997 to better understand the occurrence of arsenic (As) in the drinking water. A total of 14,866 wells were analyzed for their As content. Methods used to detect As were colorimetry based on silver diethyldithiocarbamate, an adaptation of the mercury bromide stain technique, and atomic absorption spectroscopy. As-concentrations ranged from below the limit of detection to 1.2 mg/l. Elevated concentrations were related to well depth (maximum at the 15 to 25 m category), well type (most high concentrations associated with the small household pump wells) and the date the well was built (peaks from 1980-1990). Over 43,600 persons consumed water with As-concentrations above 0.01 mg/l (14,500 above 0.05 mg/l, 480 above 0.5 mg/l). There were significant differences between different counties and villages within each county. However, the arsenic exposures were homogeneous at the sub-village levels, the lowest aggregate level in the analysis. The presented database of As in wells of the Bayannuor region provides a useful tool for planning future water explorations when combined with geological information. It also helps to design upcoming epidemiological studies on the effects of arsenic in drinking water.



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## Significant heat waves impacts on the health of Cuban´s population

Elena CARVAJAL CIOMINA, Luis B. LECHA ESTELA, Dayro M. GARCIA HERRERA (Cuba)

One of the most significant climate change impacts already observed is the progressive increase of the air temperature. The Cuban population is well adapted to the warm and humid tropical climate conditions that prevail during the summer season, but under new scenarios of a warmer climate, it is necessary to consider the possibility that during the hottest period of the summer, episodes of very high temperatures (heat waves) could happen, with the capacity to generate extreme meteor-pathological responses in the local population's health, such as the increase of the daily general mortality, expressed in terms of excess daily mortality related to the weather variability. The year 2014 was the warmest in the Earth´s climatic records from 1880 until the present. Also in the central region of Cuba the daily extreme air temperatures had significant positive anomalies during the July-August period. It was an opportunity for comparing the behavior of the thermal régime observed in five municipalities of Villa Clara province with the synchronous daily data of general mortality. The accumulative heat stress was calculated by the sum of 3-days, 5-days and 7-days extremes air temperatures, considering the sum of daily maxima representative of diurnal heat stress and the sum of daily minima representative of night heat stress. During the studied period the statistical relationship between the daily mortality and the sum of extreme temperatures increases with the number of days considered in each sample. Three groups of days with the sum of 7-days maximum temperatures higher than 235 Celsius degrees and two groups of days with the sum of 7-days minimum temperatures higher than 160 Celsius degrees were observed. Two coincidences in the date of day and night successive and strong heat stress were found between July 27th to August 3th and between August 24th to August 29th, respectively. In both groups of days the daily mortality was 200 % of the mean mortality for the July-August period, with an excess mortality of 68 people, very significant for the Cuban statistics of daily mortality in municipalities with less than 500,000 inhabitants. The analysis was extended backward until the year 2001. A high statistical correlation was found between the increase of daily mortality and the presence of very hot days with extreme air temperatures higher than certain sum of 7-days or 7-nights values, being considerable the excess mortality. Therefore, it was demonstrated that the occurrence of "heat waves" is possible, even into populations well adapted to the heat stress, but the duration of the stressing period should be longer in the tropics than in middle or high latitudes populations.



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## Distribution features of natural foci of some important tropical diseases in the natural environment of Republic of Guinea

O.K.KONSTANTINOV, M.Y.BOIRO, S.KALIVOGUI, M.C.BALDE, M.S.DIALLO, N.CONDE (Russian Federation)

The Republic of Guinea is situated in West Africa. Its climate is humid tropical with alternative of two seasons: the dry season (from November through April) when rainfall doesn't exceed 300mm) and the rainy one (from May through October) with rainfall up to 4000mm. On recognize 4 geographical regions. Low Guinea – Atlantic littoral and coastal plains. Middle Guinea - the mountain massif of Fouta Djallon with heights 1000-1400m. Upper Guinea – the high plains (up to 600m) of Upper Niger basin. Forest Guinea – the North Guinean Elevation (600-1000m) covered by rain tropical forests considerably degraded. The combination of climate - natural factors in Guinea is favorable for whole - year circulation of many pathogenic agents of tropical diseases and promotes their wide distribution, e.g. as malaria and different helminthiases. The most active foci of schistosomias are attached to water storage basins or to valleys of low flowing rivers as in Forest Guinea. On the contrary the river blindness foci are attached to Niger tributaries with swift current water. The cholera outbreaks occur in littoral zone of Low Guinea. There are here the estuaries of many rivers, the high population density and the greatest coast pollution. The most active foci of African tick spotted fever are situated in Middle Guinea, where an intensive cattle breeding is developed. The outbreaks of Yellow fever are sporadic, though its principal vectors the mosquitoes Aëdes aegypti - habit all landscapes of Guinea. The endemic foci of Yellow fever are situated in rain forests. The main natural foci of the Lassa Hemorrhagic Fever are situated in Forest Guinea where the permanent deforestation is favorable to the life cycle of rodents – the reservoir and the main vector of this fever. Some habits of local population favor to transmission of this virus as well as. As to dramatic situation with Ebola Hemorrhagic Fever in Guinea, its natural foci are probably situated in Forest Guinea too. But the veritable causes of this outbreak are still uncertain.



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**Complex approaches to the study of type's adaptation of nonresident students to conditions of the metropolis (St. Petersburg)**

Yana SCORYK, Ekaterina SEMOVA, Marina TRUBINA (Russian Federation)

Introduction. Many young people come to Russian universities from different climatic zones, with different national characteristics, culture, lifestyle and social status. The problem of adaptation requires a systematic approach and interdisciplinary research of the adaptive capacity's potential and adaptation mechanisms, in order to guaranty the successful entry of students into the educational process. The purpose – development of methodology for integrated assessment of impact factors of the natural and social environment to the processes for adaptation of nonresident in the St. Petersburg. Methods and materials. During the investigation two groups were formed: the object of study group – nonresident students and control group – students from St. Petersburg. At the initial stage of research, there were revealed regions of the maxima number of students. Climatic, ecological, social and economic features of these regions were analyzed. The second stage included development of methodology for a complex assessment of adaptation. The focus group consisted of 100 students from different courses. Screening researches of student's health have been realized using hardware complex. The database included personal information of students (profiles, lifestyle, medical) as well as variety of information on weather, environmental conditions, geomagnetic activity and space weather, including the calculation of biometeorological indexes. Results. The main natural and social factors influencing in adaptation of students were revealed. Input data were prepared for further using of GIS. Conclusions. The results showed that the general form of adaptation is a social type but the effect of weather factors influence the deterioration in the health of students and was likely to an individual. The authors have made recommendations for students and university administration.



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## The ecological and geographical factors of the Chechen Republic population's health

Halimat ELDAROVA (Russian Federation)

The ecological and geographical factors of the Chechen Republic population's health The attention has been paid to interrelationship between ecological and geographical factors of the health of the population of the Chechen Republic. The habitats in the territory of the Chechen Republic with various conditions and factors of morbidity have been identified. Some trends show the worsening the health status of the population.



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## Air pollution and oncological morbidity of population of the Ukraine's regions

Anatoliy KORNUS, Volodymyr SHYSCHUK, Olesya KORNUS (Ukraine)

Environmental and health indicators are important markers of the ecological situation. It is important to clarify the role of environmental factors in shaping the overall health and find the dependencies and relationships between these phenomena. This is the most important problem of the regional environmental analysis. The main task of medical and environmental researches in the environmental analysis is an assessment of health risks from exposure to environmental hazards. However, reaction to the impact of various natural and economic factors is very complicated. We present calculations of dependence morbidity population of Sumy region (Ukraine) nosologies cancer from environmental condition of air. For most indicators was obtained average values of the coefficients of pair correlation (r = 0,4-0,46), which were tested for reliability. The link between cancer incidence and total volume of emissions is expressed by the equation linear regression y = -19952,6 65,7 x (r = 0,46), the relationship between cancer incidence of population and density of emissions y = -189.3, 59h (r = 0,44), the relationship between cancer incidence and volume of emissions from stationary sources of air pollution can be described by the equation y = 0.03 x -8.13 (r = 0,4), and the relationship between morbidity and emissions from mobile sources y = -9842.2 34 (r = 0,4). Thus, it was found that the level of cancer incidence depends on the level of air pollution, the quantitative values of this relationship are given.



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## Medical intersectoral complex

Gleb MAMYRKIN (Russian Federation)

One of the most important and expensive areas of modern life is health care. But the health delivery system is only part of the extensive intersectoral medical complex, which includes a branch of the medical industry, legal and other services. Currently, the cost of the medical complex in United States exceeds 20% of the country's gross domestic product. Moreover, this percentage continues to grow, despite the reduction in the expenditure on health care. The structure of medical complex varies around the world, and depends on the level of social and economic development, of the country-specific features of health insurance and investments in the medical industry. The differences in this structure are not only globally, but also on regional level. There are certain patterns in medical enterprises and institutions in different countries. Therefore, now there is a typology of countries by level of development of the medical complex and crosscutting by accommodation type of medical facilities. Medical complex is one of the most important and rapidly developing, and this research is very up-to-date and relevant today.



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# C12.20 History of Geography

## Exploring and mapping lands, air and waters. Research on the History of Geographical Explorations 1

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- From corridors of knowledge to utopian highways in Africa: the explorer's prelude to Western expansionism (ca.1800-1885)

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- La Suisse et les explorations africaines

  *Patrick MINDER (Switzerland)*

- Vanguards of the Empire? Colonialism and 'heterodox discourses' in the experience of a French explorer, Henri Coudreau (1859-1899)

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## Exploring and mapping lands, air and waters. Research on the History of Geographical Explorations 2

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- Image of Russia on the foreign maps of the XVI-XVIII centuries

  *Liudmila ZINCHUK (Russian Federation)*

- Maps of Tartaria in a private collection

  *Marina TOLMACHEVA (Russian Federation)*

- «Martsialnyje vody» as the first health resort with mineral springs in Russia

  *Alexey SOBISEVICH, Vera SHIROKOVA (Russian Federation)*

## Exploring and mapping lands, air and waters. Research on the History of Geographical Explorations 3

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  *Alexey POSTNIKOV (Russian Federation)*

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# From corridors of knowledge to utopian highways in Africa: the explorer's prelude to Western expansionism (ca.1800-1885)

*Jan VANDERSMISSEN (Belgium)*

In this paper, we will try to underpin the claim that during the "imperial" epoch explorers helped constructing what one may call "corridors of knowledge" – arteries between coastal stations and Africa's inner regions which served as conduits for intelligence which was predetermined by the prospect of conquest or commercial expansion. Explorers moved inland with fixed concepts that steered observation. If lucky they returned with firsthand information about aspects of the lands visited, thus answering questions that sprouted from scholarly, strategic or economic debates at home. The corridors where the exchange and transfer of knowledge took place were not chosen at random. They followed a grid that either had historical roots or were the product of Western initiative. Vectors of competition between Western powers crisscrossed the continent. The 1850s mark the transition to the second Industrial Revolution where technical innovations promoted the exploitation of overseas resources more firmly. Engineering expanded overseas with construction works in pro-Western Egypt, implicating Western elites into expansionist initiatives. Utopian philosophies made science the basis of general human progress and offered inspiration for projects in Africa. Here – we claim – knowledge produced by explorers was crucial. European readership got the image that inner Africa was a territory in need of economic development. Explorers reported on the "masses" living in the "heart" of Africa who could be turned into consumers of industrial products. We will deduce from the sources strengthening arguments for the claim that one of the explorer's objectives was the collection of data necessary for constructing passageways to lucrative markets. In our view, the "corridors of knowledge" turned into "highways" for the introduction of Western technology. This project focuses on the collection of publications from voyages of exploration preserved at the Joseph F. Cullman 3rd Library of Natural History (Smithsonian Institution, Washington DC), investigated during a Fellowship in Spring 2015.



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## La Suisse et les explorations africaines

*Patrick MINDER (Switzerland)*

Malgré son passé sans colonies, la Suisse a contribué largement à l'exploration du continent africain dès le début du mouvement de la colonisation. De nombreux employés au service des colonies européennes. Par exemple, dès sa création jusqu'à sa reprise par la Belgique, l'Etat indépendant du Congo compte des Suisses (4e rang des nations engagées sur place). Des missionnaires, des aventuriers de tous bords mais aussi des scientifiques suisses mandatés par des institutions (Angola en 1928-1929, 2e plus grande collection zoologique mondiale en Suisse) ont arpenté, mesuré, cartographié et photographié l'espace africain. Cette contribution sera illustrée par des sources originales et inédites comprenant des relevés des expéditions menées par des employés coloniaux suisses (simples bureaucrates transformés de fait en explorateurs), des plans et des photographies des lieux visités ainsi que des sources écrites comme des journaux de bord ou des notes de voyages. Ces tracés sont réalisés sur des supports matériels parfois difficilement acheminés dans les régions les plus reculées. Les explorateurs remontent les cours des rivières et prennent des notes au fur et à mesure de leur avancée. Les contacts avec les populations locales sont souvent conflictuels, car l'exploration est accompagnée d'une volonté statistique de recensement servant à fixer l'impôt. Ainsi, contrairement à l'idée communément admise d'une phase exploratoire pacifique sans accroc majeur, il a fallu contourner de grandes difficultés, au mépris des populations locales, pour assurer la mainmise sur des régions entières. Les Suisses en Afrique ont donc contribué à leur manière au développement et à l'expansion du mouvement colonial.



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**Vanguards of the Empire? Colonialism and 'heterodox discourses' in the experience of a French explorer, Henri Coudreau (1859-1899)**

*Federico FERRETTI (Switzerland)*

An established international literature considers geography to be a science of the empire and presents generally geographers, cartographers and explorers as instruments of the physical and epistemological violence of colonialism. In the last years, several studies have focused on the anti-colonialist and heterodox discourses which characterized a small but significant part of European science of the Age of the Empire. The main example was the circuit of anarchist geographers Élisée Reclus and Pëtr Kropotkin, whose critique of colonialist, racist and Euro-centric issues has been recently rediscovered. This paper focuses on the itinerary of Henri Coudreau, French explorer who was firstly send to Amazonia ad Guyana by French government for colonial purposes, and who became there a 'maverick', living with indigenous people and proposing utopian projects for an independent Amazonia. In the last years of his life, Coudreau was considered a traitor by French administration because he offered his services to Brazil's government, which was then a France's competitor for the definition of Guyana's borders. Coudreau, rather close to Saint-Simonian ideas, considered himself to be something like an anarchist in his correspondences with Reclus; after his death, his geography was used against French interests in the 1900 Swiss arbitrate which decided the border dispute between Brazil and French Guyana. Drawing on Benedict Anderson's concept of 'anticolonial imagination' and interrogating all available sources, this papers aims to clarify the Coudreau's positions on French colonialism, as well as his relations with Reclus, task which could also deserve to partially deconstruct current commonplaces on the explorers as mere instruments of the empire.



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## Image of Russia on the foreign maps of the XVI-XVIII centuries

*Liudmila ZINCHUK (Russian Federation)*

The Russian State Library possesses a collection of rare and valuable foreign maps of XVI-XVIII centuries, depicting the entire territory of Russia and its regions. Corps of these maps in the contemporary literature got generalizing name of "Cartographic Rossika. These maps date back to the heyday of cartography and art engravings in Europe and represent not only the main stages in the spread of geographical knowledge of the country, but also in manufacturing techniques of map-making. Mentioned maps are not only evidence of various historical periods and political claims, but also provide insights about changes in the perception of Russia in Western European public opinion from "Sarmatia" and "Scythia" to "Russia" and "Muscovy". In XVI-XVII centuries, it has become possible thanks to the combination of Russian geographic data and Western European cartographic science The Petrine epoch created in cartography the phenomenon of "Russian Rossica." In the XVIII century the growing prestige of Russia, its political recognition by foreign powers is reflected in European cartography. Henceforth overgrown territory of the former Moscow kingdom cartographers call "Russian Empire". Many of politically important and spectacular maps were created in the workshops of the European cartographers and often on request of the Russian rulers. The study of maps and atlases, constituting the collection of "Cartographic Rossica", is currently carried out in the Russian State Library in order to identify the role of domestic mapmakers in collecting the geographical data about Russia, which in their turn have been used by foreign mapmakers in creating of the wonderful examples of European cartography. The paper goes to present the results of the investigation.



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## Maps of Tartaria in a private collection

*Marina TOLMACHEVA (Russian Federation)*

The paper offers a glimpse of a series of historical maps of Asia and southern Russia that was collected in the 1980s and 1990s. These are antique printed maps acquired according to the owner's interests and produced mostly between 1600 and 1750. The maps include color and black-and-white large-scale maps of Eurasia or East Europe from the Polar Ocean in the north to the Black Sea in the south and to the Pacific in the east. They reflect the history of exploration, surveying and mapping, including the exploration of borderlands, waterways, and ethnic geography. The majority were produced by Western travelers, explorers and cartographers. Several are among the famous examples of Russian imperial and oceanic explorations. A few were designed to show roads and/or itineraries, in particular those leading from Russia to Asia. Well preserved and generally readable, the maps are not particularly rare, but together they present an emerging picture of progress in the cartography of eastern Asia and Central Asia. Of particular interests are representations of the Caspian Sea, Crimea, and the trans-Volga area. The growth of geographical knowledge illustrated in the collection is more dependable than accuracy of political borders that may be anachronistic. A large city may be absent, while secondary cities appear for no apparent reason. Connection between Western authors and their eastern European sources is sometimes traceable through toponymy or has been previously established by historians of cartography.



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# «**Martsialnyje vody**» as the first health resort with mineral springs in Russia

*Alexey SOBISEVICH, Vera SHIROKOVA (Russian Federation)*

Mineral waters were one of the main subjects of investigation in Russia since the 18th century. The process of mineral water research was connected with their use for drinking and therapeutic purposes. The state activity for the exploration of healing mineral waters was carried out on the initiative of Russian Emperor Peter I. He had seen such foreign mineral resorts as Spa and Carlsbad and decided to look for some national resources of healthy water. In 1714 peasant Ivan Reboev filed petition to Peter I with the offer to use the source of healing water in Olonets Province, which helped him to get rid of heart trouble. As the result in 1717 Peter I issued a decree about looking for mineral waters in Russia, which could be used to help with solving of various health problems. In 1719 mineral spring in Olonets Province was declared as healing. Soon the house for royal family and drinking gallery were built at the hydropathic, which was called «Martsialnyje vody» (Martial Waters). It was the first health resort with mineral springs in Russia. In 1720 German scientist Georg Remus compiled the first official description of that source of healing water and found out prevalence of ferric salts in its contents. After that it was decided to establish first water resort in Russia. After the death of Peter I the resort «Martsialnyje vody» was abandoned. Famous Russian poet and the governor of Olonets Province Gavriil Derzhavin (1743 – 1816) during his travel in 1785 mentioned that the source of mineral water had been blocked, when local workers tried to find iron ore there. By that time mineral waters in North Caucasus became more popular. The «Martsialnyje vody» resort›s revival happened in Soviet times, when it was open to first visitors in 1963.



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**Exploring and Mapping of Natural and Human resources of the European Russia during a Unique Experimental Mende's Surveys in the 1840s-1860s**

*Alexey POSTNIKOV (Russian Federation)*

In 1844 the Russian Military Topographic Service switched its efforts to the mapping of the Western Russia, which priority resulted in a reduction of large-scale mapping of the country's interior regions. This development impelled the Russian Geographic Society in 1846 to propose efforts to update and provide new geodetic controls for the materials of the General Land Survey which had been performed in 1765 - early Nineteenth Century. The manuscript materials of this survey had covered all European Russia. The efforts to update and improve these materials were intended to produce topographic maps which would combine geographical information of value to the wide circle of consumers. Graduate of the Finnish Topographic Corps, Major General Alexandr I. Mende (1800-1868) supervised these surveys. Original plans were compiled on a scale of 1:84,000. The geographical descriptions were a separate and important part of the Mende surveys. For the maps of Mende survey were used special conventional symbols which would be decreed in 1853 "The standard Conventional Symbols" and made mandatory for all maps of Russia until 1917. The surveys covered area of approximately 345,000 square versts. Only few atlases and maps based on Mende's surveys were published; the majority of maps and descriptions remained in manuscript form, and are kept at the Russian State Archives of Ancient Acts in Moscow. By 1926, the Soviet cartographers published some 790 sheets of topographical maps on a scale of 1:100,000, using Mende's manuscript materials and a few new surveys.



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## Exploring of East European Plain by Academician Dmitry Anuchin

*VValerian SNYTKO, Vera SHIROKOVA, Viacheslav NIZOVCEV, Olga ROMANOVA, Nadezhda OZEROVA, Alexey SOBISEVICH, Vasiliy CHESNOV, Roy SHIROKOV, Natalia ERMAN (Russian Federation)*

The scientific expeditions' explorations of the late 19th century have been epoch-making for geographical science. The investigation of river sources of European part of Russia was a whole era in the Russian geography, when researchers explored the main watershed of Baltic, Black and Caspian seas. In 1894 - 1902 the expedition organized by General Alexei Tillo performed detailed investigation of the sources of Great Rivers in the European part of Russia. Professor Dmitry Anuchin was responsible for exploring the river sources of the Volga, Dnieper and Western Dvina. The expedition of General Tillo carried out a detailed physical-geographical description of the basin of Volga, Dnieper and Western Dvina and determined the precise geographical coordinates of that rivers' sources. The large-scale maps showing the area of the watershed between the sources of these rivers were compiled for the first time. The expedition exploration of Dmitry Anuchin preceded his visit in 1890 to the area of the Valdai Hills. This trip has been described in the detailed essay "From a trip to the origins of the Dnieper, Western Dvina and the Volga". In that essay Academician Anuchin justified the term "Central Russian Upland" and gave a clear picture of the orography of the European part of Russia. That work also discussed some historical aspects of understanding the role of the watershed in Central Russia. Dmitry Anuchin summarized the results of that research in his work, which incorporated all knowledge about the lakes near upper reaches of Volga and Western Dvina. The great importance of that work is proved by the facts that the results of the expedition and some stationary studies were published and the particular attention was paid to the methods, which had been used in the lakes study. The aim of that study was collecting new factual material. Dmitry Anuchin put an enormous efforts and spent a lot of time to collect the huge number of observations. He and his assistants performed about 20,000 depth measurements of the lakes. All collected data were accompanied by text, photos, maps and tables of depth and temperature. That material became the basis for creation limnology as a branch of science.

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## Geographical research of the Smolensk province in XVIII – beginning of XX Century

*Natalia ERMAN, Vyacheslav NIZOVTSEV (Russian Federation)*

The long-standing appeal of the Smolensk land for researchers of various kind is largely explained by the fact that its territory has at all times had an exceptional importance in the history of the formation and development of the Russian state. Based on the analysis of archival materials using the comparative historical and geographical method an evaluation of the "intensity" of research in different times has been made. Special attention has been paid to different scales of historical and geographical mapping on several hierarchical levels (regional to local), which made it possible to trace the history of the formation of the borders of the Smolensk province and to determine the degree of scrutiny and features of "coverage" of the Smolensk land by geographical research. Three periods of geographical studies which were carried out on the territory of the Smolensk province have been identified. The first period–the initial geographical study of the territory (XII-end of XVIII centuries) includes four stages: 1)the appearance of the first data about the city of Smolensk, 2)descriptive geodesic (the beginning of XVIII century-1745), 3)academic research (1745-1765), 4)the stage associated with the conduct of general land surveying. The second period is divided into two stages: 1)the beginning of the XIX century-1860s.-pre-reform research, 2)1861-the end of the XIX century-post-reform large-scale field studies, including works by Dokuchaev, Tillo and others. The third period is a period of complex geographical research of the territory of the Smolensk province in the early XX century. Geographical work conducted on the territory of the Smolensk province makes outstanding scientific and cultural heritage of Russia and is a major scientific research of world importance.



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**From Generous to Hungry Steppe: Geographical Explorations of Central Asia**

*Christine Bichsel (Switzerland)*

This paper explores the environmental and spatial images of the Hungry Steppe in geographical descriptions written in Russian language during the late Tsarist and the Soviet period. The Hungry Steppe is a vast, rolling plain today located in the Republics of Kazakhstan, Uzbekistan and Tajikistan. The area's potential for industrial agriculture was already discussed in the late 19th century, and plans for canal construction and land reclamation were developed accordingly. Due to political turmoil, periods of war and financial constraints, however, it was not until the 1950s that these plans found their realization in the development of irrigated agriculture. In this paper, I focus on the discursive construction of the Hungry Steppe in geographical descriptions of scientific narratives which preceded, accompanied and retrospectively justified the large-scale transformation of this particular environment. I aim at exploring the discursive shifts of environmental and spatial images of the steppe, understood to be moments in time when these images changed their form. Special attention is also given to moments when these narratives engage with conflicting and contradicting images of the steppe, such as to the discrepancy of the Central Asian term Mirzachul' and the Russian term Golodnaya Step' for the same environment. While the former may be translated as generous steppe, the latter describes the steppe as being hungry. For the purpose of this paper, I analyze geographical descriptions of the Hungry Steppe in scientific publications dating from the 19th and 20th century which are available in libraries in Moscow and Dushanbe.



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## The study of historical waterways as actual historical and modern scientific research

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The historic waterways of the European part of Russia are unique objects with ecotourism and nature-recreational potential. The comprehensive historical-scientific expedition "Hydro-ecological environmental, ecotourism and recreational potential of the historic waterways of the European part of Russia" was began in 2003. In 2003, the expedition studied the Mariinsky water system, in 2005 the lake-channel system at the Big Solovetsky island, Belozersky-Onega waterway in 2006, Northern Dvina waterway in 2007-2008, Vyshnevolotskaya water system in 2009, Tikhvin water system in 2010-2011, rivers Western Dvina, Dnieper, Berezina and Upper Volga on "The way from Varangians to the Greeks" in 2012-2014. As a result geographic information base on historic waterways at the European part of Russia was created, which contains information about hydrological and hydrochemistry data, landscape, map and archival sources. Maps became methodological and technical connecting-link for filling that base. The analysis of contemporary conditions of waterways of Russia and comprehensive cultural and historical landscape with the help of topographic maps, photo and video of areas was supplemented with analysis of old maps from that region. The block of hydrological data about conditions of water objects, which became the base for expert's recommendation for future usage of water systems, was created. The bank of descriptions of hydro and historical monuments with precise geo-references was used to determine the recreational potential. It is allowing better assessment the anthropogenic transformation and evolution of landscapes. It was established that the surviving monuments of culture and hydraulic engineering in the majority need to be maintained or restored. These researches have scientific value as a methodological basis for the formation of the new historical and scientific direction and for the environment friendly land use, tourism and recreation.

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## The history of construction and modern usage of Augustów Canal

*Alexey SOBISEVICH, Vera SHIROKOVA, Alexey POSTNIKOV, Olga ROMANOVA, Nadezhda OZEROVA, Vasilij CHESNOV (Russian Federation)*

Augustów canal is the artificial waterway that connected the basins of the Vistula and the Niemen rivers. That waterway is known as hydraulic engineering monument of the 19th century and nowadays it is divided between two countries - Poland and Belarus. The total length of the channel currently is about 103 km, of which 79 km are on the territory of Poland and 24 km on the territory of Belarus. The paper deals with some aspects of construction of the canal and analyzes the socio-economic causes of its transformation from navigable waterway to the unique object of tourist attraction. We focus our attention on exploration and survey of the route of the channel its engineering solutions, which were used to create the one of largest water systems in Europe. The project of canal was compiled by a General of Polish Army Ignacy Pantaleon Pradzynski (1792-1850). From 1824 to 1839 during the building process 29 levee, 18 locks, 14 drawbridges and 24 objects for engineering service were build. Navigation locks and sluices-regulators compensated vertical drop, which was 54 meters. The canal was built with the usage of latest engineering achievements and was kept in good condition during two centuries of its history. The paper notes the current state of the channel and its significant recreation and tourism potential.

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# Mapping Cross-cultural Exchange of Geographic Knowledge: Indians and Explorers in Jaime Cortesão's comments on the Exploration of Brazilian Territory

*André Reyes NOVAES (Brazil)*

In his famous book called the "History of Brazil in Old Maps", Jaime Cortesão quotes a series of cartographic documents in order to support his comments on the exploration of Brazilian territory. In the fourth part of the second volume, the author lists documents related to the cartography produced by "Indians, bandeirantes (pioneers) and sertanistas (frontiersmen)". The thesis of the author is clear: there is an indigenous influence in the cartography produced by explores, which shows how cross-cultural exchange of geographic knowledge was essential for the success of exploration. The statements of Jaime Cortesão on the importance of indigenous knowledge in the "discovery" of Brazilian territory is already well known. However, few studies have looked closely at the large universe of maps that the author catalogued and commented in his book. This paper aims to analyse a series of maps selected by Jaime Cortesão in order to reveal the knowledge exchanges between explorers and natives. By following the author's footsteps in his comments on the Catalogue of the Exhibition on the History of Brazil, the paper seeks to identify the cartographic practices associated with the native population and classified as "primitive" or "aboriginal" by one of the most prominent historians of cartography concerned to the exploration of Brazilian territory.



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## Mapping of changing political unites and changing borders (950-1935) by Albert Halász

*Zoltán HAJDÚ (Hungary)*

Albert Halász (1890-1945) as cartographer of historical geographical processes (economic, social, political etc.) was one of the founder of modern Hungarian historical geographical mapping. With his co-author Edvi Illés Aladár they were the documentators of collapse of Austro-Hungarian Monarchy, and historical Hungary. His atlases were published in different European languages. His Atlas of Europe (1936) reconstructed the political unites (states of the Continent) and changing processes of state borders. As a Jewish scientist he was killed in a concentrated camp. For decades his memory and his valuable cartographical and historical geographical works were "hidden".



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# Rediscovering the Sea: The 19th Century Charting of the Adriatic Sea and the Development of Modern Hydrography

*Mirela ALTIC (Croatia)*

Being situated centrally in the Mediterranean Sea, the Adriatic Sea has always been the key maritime link between the East and the West. Though well known to navigators since ancient times, its systematic exploration began only in the 19th century. The first hydrographic survey of the Adriatic Sea (1806-1809), conducted under the leadership of the French hydrographer Charles-François Beautemps-Beaupré, produced the first maritime atlas of the Adriatic (the so-called Napoleonic Atlas). The first systematic hydrographic survey of the Adriatic (1817-1819) was jointly conducted by the Topographical Office of the Kingdom of Naples, the Military Geographical Institute of the Austrian General Staff, and the British Hydrographic Office. The result of their triangulation-based survey was a series of twenty 1:175 000 scale general charts (Cabotaggio del mare Adriatico, 1824), and the first comprehensive pilot book of the Adriatic (Portolano del mare Adriatico, 1830). The charting and exploration of the Adriatic was especially encouraged when Pola became a major Austrian naval base (1853) with the Hydrographic Institute of the Austrian Navy (1866), which, under the leadership of Tobias von Oesterreicher, conducted another survey as early as 1866-1872 (coastal charts at scales 1:40 000 to 1:100 000). Apart from producing the first modern charts of the Adriatic, these surveys marked the beginning of its scientific exploration, including first measurements of its geomagnetism, salinity, currents, and tides. The 19th century charting thus played a crucial role in the birth of the official hydrographic service and the development of a modern hydrographic exploration of the Adriatic.



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## Contribution of Western Travelers to Makkah "Mecca" Maps

*Ramze ELZAHRANY, Meraj MIRZA (Saudi Arabia)*

Contribution of Western Travelers to Makkah "Mecca" Maps Ramze A. Elzahrany* & Meraj N. Mirza** Department of Geography, Umm Al-Qura University, Makkah, Saudi Arabia* ** Center for Geographical Analysis, Harvard University, Cambridge, USA Abstract: The holy city of Makkah has more maps than any other city in the Arabian Peninsula. It has several map atlases and many scattered map sheets. Some of these maps are more recent while others are old. Their coverage, accuracy and quality vary based on cartographic standards. The objective of the present paper is to highlight the contribution of western travelers to Makkah maps; whether it is for the city of Makkah at large, Al-Masjid Al-Haram "the Grand Mosque" or for Al-Mashair Al-Moqadasah "The other surrounding holy sites", such as Mina and Arafat. The research will select several map sheets by different European travelers during different years. Then, it will classify them according to their coverage and evaluate them professionally. Finally, the paper will offer several recommendations on benefiting from these maps in Makkah Historical Geographic Information Systems (MHGIS). Keywords: Makkah, Mecca, maps, western travelers, MHGIS



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# Kiepert's Palestine Map 1840 after Robinson and Smith: History and Analysis of a Compiled Exploration Map of the Holy Land

*Haim GOREN, Bruno SCHELHAAS (Israel)*

Edward Robinson had undoubtedly been a central figures within the formation of modern scientific Palestine Research, extraordinary connected with the establishment of Scriptural Geography as well as Scriptural Cartography, and the Historical Geography of the Holy Land within the academic world. He travelled in 1838 accompanied by ABCFM missionary Eli Smith, the voyage to Egypt, Sinai and Palestine mainly directed to toponymy and topography of the Holy Land. Robinson wrote his epoch-making 'Biblical Researches in Palestine, Mount Sinai and Arabia Petraea in 1838' in Berlin, immediately following the exploration, with the intensive help of Carl Ritter, and it came out simultaneously in Halle, London and New York. It included various maps, drawn by a young Berlin cartographer, Heinrich Kiepert, and it formed the beginning of a long and successful career in the cartographer's community. Kiepert compiled all the maps for the Biblical Researches, and continued to accompany Robinson's further publications, as well as many other concerning the Holy Land, historical as well as recent maps. Kiepert's first map, 'Karte von Palaestina vorzüglich nach den Itinerarien und Messungen von E. Robinson u. E. Smith. Halle: Waisenhaus, 1840', hand-drawn and colored sketch, is kept in the Map Department of Berlin State Library. Kiepert used a lot of sources to compile his map, and besides Robinson's original travel data (itineraries, diaries, bearings) he processed a number of published reports and maps. The compilation was part of a very complex and time-consuming map-making process, observed by Robinson very critically. In his Map Memoir Kiepert described the working and the used sources in detail. This unique document is an outstanding example of the data accumulation and map-making process; it also provides a unique opportunity to analyze the accuracy of the cartographical issues.



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IGU2015 – 1147

## Geographical Exploration in Turkey: A Disciplinary Survey

*Erdem BEKAROGLU (Turkey)*

The aim of this study is to explore the production of geographical knowledge in Turkey as one of the local intellectual centers in the world. As studies on the sociology of philosophies revealed, production of intellectual knowledge has almost always a local dimension. Several conditions such as the existence of several independent and interrelated intellectual groups, inter-generational networks as well as the structural rivalry are largely decisive for those local centers to emerge as source areas of intellectual knowledge. By using three sets of different empirical data, this study attempts to reconstruct historical evolution of the geographical exploration in Turkey as a local center. The first data are composed of comprehensive reference analysis of articles published (from 1943 to 2013) by Turkish geographers in the local academic journals. The second one is dealing with the geographical traditions derived from monograph books published (from 1940 to 2005) by Turkish geographers locally. And the last one measures the international performances of Turkish geographers by taking into account their international journal articles between 1945 and 2015. Results show that Turkish geography gradually emerged as a local intellectual source area starting from 1930s up to 1960s. In this period, geographers, mostly educated in the continental Europe, split between two different schools and a competition occurred both within and between them. Although the geographical exploration was carried out by European workers before, especially after 1940s, leaders of the local intellectual development replaced them. However, by 1960s, local actors of the discipline largely ignored the new developments observed mainly in the Anglo-American world, so that the new generation gradually became introverted. At this stage, intellectual production gradually exhibited stable patters of ideas and of energies that made up intellectual routine, which is a matter of adding details to what is already known in the large. By the time, intellectual routines showed defensive attitudes in which existing traditions were strongly supported and glorified. Under the degenerative conditions, pulses of intellectual innovations were largely suppressed. However, the routine patterns of the discipline as a local center of the intellectual development started to change by the new millennium mostly because of the increasing interaction with the other local geographies in the world. *This study is supported by the Scientific and Technological Research Council of Turkey (TUBITAK project no: 114K063).



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# Space coming to time: on the translation of the peripheral into the national context in modern Japan

*Naoki OSHIRO (Japan)*

From the end of the eighteenth century, a succession of foreign ships came to Japan pressing for commercial intercourse. The Tokugawa Shogunate quickly prioritized the importance of coastal defense, promoted the exploration of remote northern regions like Hokkaido and Karafuto, and, in the nineteenth century, made haste to complete the first precise map of Japan based on modern surveying techniques. Examples of these activities are represented by Rinzo MAMIYA (1780-1844) and Tadataka INO (1745-1818). After the Meiji restoration (1868), when the time had come to build the modern nation-state, the Japanese government went even further in promoting these activities in conjunction with establishing the notion of a national territory. They started to attach increasing importance to the more peripheral or remote regions. The best-known explorer of the this period, Gisuke SASAMORI (1845-1915) explored just such peripheral regions— the Chishima (Kuril) Iislands and the Ryukyu Iislands — in 1892-93. On the other hand, interest in the periphery was not just in terms of frontiers and borders, there were also qualitative and cultural perspectives. A university professor of agricultural policy, Inazo NITOBE (1862-1933), had developed an increasing interest in rural affairs and provided a venue for the salon "Kyodokai" to discuss them in 1910. From that point onward, shared interests in details of the rural affairs as the object of academic study were gradually articulated and objectified. Increasing interests in the rural regions and rural cultures was also connected with interest in folklore in general . An important member of the salon, Kunio YANAGITA, founded Japanese folk studies. He initially intended to use comparative methods, but after 1910 changed to confine the research object to within the national territory. One of his key concepts is "Hogen shuken setsu" (concentric circle of dialects theory) which explains the configuration of dialects by transferring geographical or spatial remoteness to historical or temporal remoteness. In other words, this is a projection of a temporal axis onto a spatial axis and is similar to culture diffusion theory. However, this concept is only valid within a national territory. It cuts the possible lines of continuity to other regions outside the national territory, though there are some regions, say, Tsushima or Okinawa, which had strong links to and were influenced by neighboring countries like Korea and China. This paradigm is still influential today for examining the geographical issueses of the relationship of peripheral regions to central Japan. It links with some kind of Orientalism through the process described above, not only in for academia but also in the popular imagination.



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**Le Brésil inconnu : les récits produits par les géographes français au Brésil (1934-1946)**

*Gustavo Francisco Teixeira PRIETO, Elisa Favaro VERDI (Brazil)*

L'objectif de ce travail consiste à analyser, à partir de récits de voyage, des rapports scientifiques et des activités de terrain les impressions qui les géographes français ont eu sur l'intérieur du Brésil lors des explorations géographiques visant la connaissance du territoire dans les années 1930 et 1940. Le Brésil de cette période a été encore principalement occupé dans les régions côtières, et dans les années 1930 commence un processus profond de modernisation du territoire mis en place par l'Etat. Trois institutions révèlent ce processus de modernisation : (i) la création de la première université du Brésil en 1934 à São Paulo, qui a été fondée par les jeunes professeurs français qui sont venus au Brésil en mission d'enseignement et de recherche ; (ii) la création du Conseil national de géographie (CNG) en 1937, agence d'Etat qui visait la production des données, des informations statistiques et des descriptions du pays, en particulier sur les territoires à occuper a l'intérieur du Brésil (la région ouest et de l'Amazonie) ; et (iii) la fondation de l'Association des géographes brésiliens (AGB), une association qui visait à produire des analyses et des recherches scientifiques sur ce pays encore inconnu. Ainsi, nous avons analysé les productions développées au Brésil de deux géographes français : Pierre Monbeig qui a vécu et a travaillé au Brésil de 1935 à 1946 et Pierre Deffontaines entre 1934 et 1939. Ces géographes français ont eu le défi de connaître le Brésil – un pays pratiquement inconnu pour eux - et ont laissé une génération de disciples qui ont gardé une tradition de méthodologie de la recherche française dans la géographie brésilienne.



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**Brazilian and French geographies: two comparable histories in the quantitative field**

*Mariana LAMEGO, Sylvain CUYALA (Brazil)*

Quantitative geography was one of the most revolutionary intellectual movements within geography and perhaps one of the most misunderstood (also). Quantitative geography has its origin in specific time and venues, the American and British academic geography in the sixties, but it has an astonishing spread among the western world, during the seventies and the eighties, whose temporal evolution and spatial configuration remained largely unknown. This paper intends to contribute to the studies about quantitative geography, offering an analysis of its diffusion, taking into account two previous investigations on the history of quantitative geography in France and in Brazil. Our aim is to compare the incorporation and diffusion of quantitative methods in French and Brazilian geographies, considering the role developed by some institutions and main actors which promoted the cooperation, networking and circulation of its theories and practices, which in its turn helped to create clearly distinctive versions of quantitative geography. Keywords: Quantitative and theoretical geography, spatio-temporal process, science dynamics, scientific networks



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## Formation and dynamics of the borders of the Smolensk Land (IX – XXI CENTURIES)

*Natalia ERMAN, Vyacheslav NIZOVTSEV (Russian Federation)*

Based on the analysis of a number of historical maps covering the territory of the Smolensk land starting from the period of formation of the ancient Russian state to the XXI century we have identified four main periods of the formation of the territory and dynamics of the borders of the Smolensk land (principalities, governorships, provinces, regions). "Old" or "Principality" period is the time of formation of the Smolensk principality from IX to XIII centuries. By the XIII century the Smolensk land occupied the territory between the rivers Sozh - Dnieper - Kasplya, the headwaters of the Western Dvina (near Toropetskie and Zhizhetskoye lakes), between the rivers Dnieper and Desna and included Toropets, Verzhavsk, Mogilev, Kopys. The second period starting from the end of the XIV century and to 1654 was the "Transitional" period because the boundaries of the Smolensk land and its administrative structure changed repeatedly. The Smolensk land was the subject of a constant struggle with varying success between the Russian and Lithuanian states. The Smolensk land finally becomes a part of the Russian state in 1654 as a result of the winning in one of the Russian-Polish wars. Starting from that time and until 1917 the "Provincial" period of the formation of the region begins. In 1708 the Russian Empire undertook a provincial reform by founding 8 provinces, including the Smolensk one with the administrative center of the same name. The last period, so called "Modern" or "Regional" period (1917 - XXI century). In 1918 the Western area was established, which also comprised the Smolensk province with the center in Smolensk. The Smolensk region was formed in 1937, it included 49 districts. In the postwar years the territory of the Smolensk region remained virtually unchanged, changing only the internal borders of its districts, which were either abolished or restored. However, after the collapse of the Soviet Union the Smolensk land became a border region of our country again. Currently the Smolensk region consists of 25 districts.



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# Russian Geography during the Great Patriotic War (1941–1945): to the 70th Jubilee of the Victory

*A.A. AGUIRRECHU, G.M. LAPPO (Russian Federation)*

The Great Patriotic War, which led to the Victory over the fascism, had stimulated the development of geography in the USSR. Besides those who had been involved in the military operations directly, geographers contributed to the Victory in several ways. The mission of military geographers included creation of topographical maps (including those of new types, e.g. maps of territorial maneuverability), working in meteorological and hydrographic services, making special geographical descriptions of territory for military needs. Their principal objectives included investigating resources for the army and inhabitants, grounding re-allocation of the factories and services which were evacuated and moved to the East of the country; modernization of the transportation grid and finding new arable areas. One of the most significant roles was played by Nicolay Kolosovskiy who headed the transportation and energy group within the Academic Commission for Resource Mobilization of Ural for Needs of Defense, created during the war. He and some of his colleagues received the Stalin (State) Prize of the first degree. Among the issues of significant importance there was creation of complex characteristics (within the paradigm of regional geography) of several countries which were territorially involved in the military operations, including Germany and Japan. In spite of harsh conditions, the educational and research processes had never been suspended within the Academy (including Universities in Moscow and Leningrad and many other institutions), which was evacuated to the East fully or partially. During the first years after the Great Patriotic War, those students who had been taken out of the educational process straight to the battle-front came back to the Universities and carried on with the studying. There yesterday's soldiers met yesterday's highschool students, the so called "children of the war". Many of them soon became the prominent researchers in different areas of the geographical science.



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## Expedition of I.G.Voznesensky to Russian America in 1839-1849

*Tatiana FEKLOVA (Russian Federation)*

Russian empire knows about lands to the East from Kamchatka at the end of the XVI century. Development and systematic research of these territories was conducted with the end of the XVIII century under the leader of the Russian-American company. This company was created by 8 on July 1799 for the organization of trade with local populations. Expeditions were an integral part of the activity of the Russian Academy of Sciences. In the first half of the 19th century, the territory of the Russian Empire included some regions of North America (Alaska, North California and the Aleutian Islands). The study of these areas was carried out with the participation of the Russian-American Company. The greatest merit for the scientific study of these regions belongs to a scientist from the Russian Academy of Sciences, Ilya G. Voznesensky. His expedition continued for 9 years and 10 months. The main aims of this expedition were the ethnographic description of native peoples and the collection of zoological and botanical samples and mapping the lands. The Russian Academy of Sciences gave Voznesensky different instructions. Voznesensky's expedition represented an attempt at a full study of these regions. During the years of the expedition Voznesensky explored Russian California, Alaska, the Aleutian and Kuril Islands and Kamchatka. Many of these areas a few decades later were transferred to the United States. Thanks to the Voznesensky expedition, the Russian Academy of Sciences possesses the largest collection of ethnographic and natural-scientific objects from Russian America in the world.



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# The Russian expeditions to Central Asia: The 'epic era' of Przhevalskii's explorations and his system of field work

*Tatiana YUSUPOVA, Alexandr ANDREEV (Russian Federation)*

Russia's extensive study of Central Asia continued for several decades and was a most successful enterprise, having made an extremely valuable contribution to our knowledge of the geography of Inner Asia, as well as natural sciences, ethnography and partly archeology. The best known Russian explorer of Inner Asia of the 19th century is N.M. Przewalskii. He was a versatile explorer, who made a considerable and lasting contribution to many branches of science. The purpose of his expeditions was a preliminary 'scientific reconnaissance' of the vast and largely uncharted area of the Asian Heartland. The primary task of this reconnaissance was to wipe off the numerous "white spots" from geographical maps of Asia. Przhevalskii was followed by a host of other Russian explorers, both military and civilian. For his followers he compiled a kind of manual "How to travel in Central Asia" that summed up his long-time experience as a field surveyor. In this essay Przewalskii examines in details the personality of an ideal traveler, the practical skills and knowledge neded for field work, the expedition set-up and equipment, the success factors, the field research methods and outlined the regions of Inner Asia for further exploration. This work, is of great interest to historians of geography as a source on the history of the Russian exploration of Inner Asia, its goals, methods, national peculiarities at the turn of the 20th centuries. The paper analyzes the principal points of Przhevalskii's essay and its implications for the later exploration by Russian travelers.



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# C12.21 Indigenous Knowledges and Peoples' Rights

## Indigenizing development for community needs

**Chairperson(s):** *Evelyn PETERS, Brad COOMBES*

- Geographical Indications As An Agency To Preserve Indigenous Knowledge - Studying the Handloom Sari Heritage of Bengal

  *Anjan SEN, Ankita CHAKRABORTY (India)*

- Making sense of the changing scene: the need for longitudinal studies among indigenous people

  *Lesley POTTER (Australia)*

- Establishing a Volunteered Indigenous Knowledge Base about Environments in Taiwan

  *Sendo WANG (Taiwan (China))*

## Environmental justice and Indigenous rights 1

**Chairperson(s):** *Brad COOMBES*

- Conservation subdivisions – new possibilities for implementing the Indigenous right to development?

  *Brad COOMBES (New Zealand)*

- In defense of slash-and-burn agriculture and the management of mountain grasslands

  *Bojer CAPATI (Philippines)*

- Environmental and Social Impacts of Large Scale Hydroelectric Projects in Kinnaur a Tribal District of Himachal Pradesh in Western Himalaya (India)

  *Haresh SHARMA, Mir JALAL (*India*)*

## Environmental justice and Indigenous rights 2

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- Aborigine cultural landscapes in the Arctic: present day status and protection measures

  *Tatiana KRASOVSKAYA (Russian Federation)*

- Landuse Rights of the Soliga Indigenous Communities in Male Mahadeswara Hills and Sathyamangalam Hills of Southern India

  *Divya SWAMINATHAN (Germany)*

- Governance of MPA and indigenous cartography in the western Caribbean

  *Akiko IKEGUCHI (Japan)*

## Long-term engagement in Indigenous research



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**Chairperson(s):** *Richard HOWITT*

- Filmmaking, Collaboration and 'Decolonizing Methods' in PhD Research

  *Amber Murrey NDEWA (United States of America)*

- Connecting past and present research in Northern Australia

  *Siri VELAND (United States of America)*

- Giving Back - Geographic data collected in 1965 returned to an Indigenous community in a rural town in NSW , Australia

  *David CREW, Richard HOWITT, Janice MONK (Australia)*

## POSTER EXHIBITION

**Environmental justice and Indigenous rights**

- Building Arctic Sustainable Communities to Protect Indigenous Rights in the Age of Climate Change

  *Victoria HERRMANN (United Kingdom)*



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## Geographical Indications As An Agency To Preserve Indigenous Knowledge - Studying the Handloom Sari Heritage of Bengal

*Anjan SEN, Ankita CHAKRABORTY (India)*

Handlooms in Bengal are not only an important source of livelihood but also repository of rich cultural heritage and traditional knowledge, inherited over generations by family of weavers. The importance of handloom can easily be ascertained from the fact that, it provides employment opportunity, next only to agriculture. The traditional handloom sari heritage in Bengal comprises several varieties, of which Baluchari, Dhaniakhali, and Santipore, are the finest specimen. These saris are unique due to the entire making process, ranging from 2-3 days for Dhaniakhali and Santipore Saris; and 1-4 weeks for Baluchari Saris. In the latter, the depiction of mythological scenes from eternal epics Mahabharata and Ramayana, have attracted the imagination of ladies since time immemorial, possessing which is an asset, and is passed across generation as part of the family heirloom. Each item is a gorgeous piece of art, encompassing immense effort and true touch of the artisan's delicate fingers. To protect this unique technique of weaving and associated fame of the three saris, they were registered as Geographical Indications (GI) during the period 2009-11. GI indicates defined geographical origin of the product, referring to a location, and conveying an assurance of quality and distinctiveness. The GI tag has enhanced the reputation of the three quaint villages – Bishnupur, Dhaniakhali and Santipore (in the state of West Bengal in India), hitherto unknown to the world. It has aided in preserving the age-old tradition of sari weaving and associated crafts; and has the potential to boost up the entire cultural economy of the three villages.



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## Making sense of the changing scene: the need for longitudinal studies among indigenous people

*Lesley POTTER (Australia)*

Massive changes – economic, cultural and environmental - have taken place in rural areas of Indonesia during the past 20 years, especially in Sumatra and Kalimantan, with the intrusion of oil palm plantations into traditional village lands. To comprehend the full impact of these changes and represent them accurately, outsiders should undertake longitudinal studies with frequent follow-up visits. These are especially important when working with indigenous groups, where cultural changes may work themselves out over several years. In the district of Sanggau, West Kalimantan, the culture and economy of the essentially sedentary Bidayuh Dayak population was focussed on swidden rice with extensive fallows, small areas of closed forest, mixed fruit orchards and rubber gardens. Now much of this diversity has disappeared from the oil palm areas and with it, many cultural 'markers' of Dayak identity. Oil palm is a volatile commodity: changes to market prices or government regulations can impact hugely on farmer behaviour and perceptions, while a new pest, such as a rat plague which destroys valued rice crops, can easily bring despair. Researchers can also correct inaccurate perceptions of past situations. We thought our initial selection of study villages was representative; later we found we had unwittingly chosen the district's most flexible plantation, with a strong co-operative supporting smallholder growers: other plantations have been very different. Economic outcomes have thus varied greatly across the district and there are emergent social problems of gambling and alcoholism. Drying streams, attributed by locals to oil palm, may be permanently affecting the environment.



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**Establishing a Volunteered Indigenous Knowledge Base about Environments in Taiwan**

*Sendo WANG (Taiwan (China))*

The long history living in Taiwan has made the indigenous people having their own way to explore and to treat the mountains, streams, and living creatures. Their pedagogy to establish and to pass their own environmental knowledge is completely different to the "modern" science education. However, the younger generation of the indigenous people is losing their traditional point of view to their environment under current education system. This is not only a huge loss of indigenous knowledge, but all Taiwanese also lost a chance to treat this island in a more sustainable way. Previous researches most rely on one or a group of researchers to collect data and then edit them into an encyclopaedia or a knowledge base, and distribute the knowledge via the World Wide Web (WWW). In this methodology, indigenous people are passively invited. Inspired by the huge success of Wikipedia, this research is based on the concept of Web 2.0, which makes every indigenous people as a knowledge provider. A volunteered geographic information system (VGIS) is built as a platform to gather and to integrate indigenous people's environmental knowledge. The knowledge which could be a text file, a voice recording, a photograph, or a video clip, is no longer edited by any authority but by every indigenous participant. All of the discussion and modification to the knowledge will be logged into the history. So the system does not only provide the final result, which should be the most commonly accepted, but also provide the complete discussion progress if necessary. Considering the software accessibility, this research adopted Drupal as the content management system (CMS). The spatial data is mapped based on the web mapping service (WMS), provided by OpenStreetMap, Bing Map, Google Map, etc. So an indigenous people can draw a map about anything, such as the dangerous point, the tribe's boundary, the fishing area, the hunting area, the conservatory area, or the landslide area. Benefit from the open and multi-lingual characteristics, this geographic information can be recorded, displayed, and distributed in their native language. We hope, in this way, the traditional indigenous knowledge and pedagogy can be preserved and inherited with modern digital tools. The developed VGIS has shown its potential in its testing stage. We'll introduce this system to three different tribes in the next stage, and encourage every indigenous people to participate. The gathered user experiences and feedback will be used for keep improving the VGI system.



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## Conservation subdivisions – new possibilities for implementing the Indigenous right to development?

*Brad COOMBES (New Zealand)*

The right to development remains the most unfulfilled of Indigenous rights and is strikingly problematic in the era after land claims settlement in New Zealand. Although Maori receive new rights in that era and, indeed, they may be required to meet certain developmental or economic criteria in their 'full and final' settlements, White environmentalists monitor closely development proposals and fear Maori attempts to regain social parity with haste. In that context, conservation subdivisions – large planned developments that integrate elite forms of peri-urban living with protection of native habitat – seem to provide a novel solution for Indigenous land trusts that may escape the typical concerns about negative environmental externalities from post-settlement development. Nonetheless, Maori experiments with conservation subdivision have been controversial, often resulting in stalled projects or a failure to secure development rights through the planning process. Te Uri o Hau, a sub/tribe located north of Auckland, has attempted to develop its new land base responsibly, but its plans for a major conservation subdivision at Te Arai Point have been subject to harsh scrutiny in the media and hundreds of opposing submissions from environmental and recreational lobbies in the planning process. A critical discourse analysis of the framing of the sub/tribe's plans at Te Arai reveals the obstacles to environmental and historical justice for Indigenous peoples in urbanising spaces and the continuing racialisation of the planning process. The key article of the Treaty of Waitangi (1840) may have offered "te tino rangatiratanga o o ratou wenua o ratou kainga" (the very essence of chieftainship over [Maori] lands and villages), but settler society is vehemently opposed to Maori leadership in peri/urban design.



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## In defense of slash-and-burn agriculture and the management of mountain grasslands

*Bojer CAPATI (Philippines)*

The Mts. Iglit-Baco National Park (MIBNP) in Mindoro island, Philippines is a mountain grassland landscape with outstanding histo-cultural and natural heritage values. Like other grasslands ecosystems in the world, the MIBNP is shaped by centuries of human activity, specifically by the Tau-Buid and Buhid Mangyans, the indigenous groups residing and practicing kaingin (slash-and-burn agriculture) inside the rugged terrains and plateaus of the park. Its many rare and endemic species make it the best representative of the biodiversity of the Mindoro biogeographic zone. The park is also an important watershed in the island. While the resilient ecosystem supports specially-adapted species, the MIBNP has become particularly fragile due to changes in climate, indigenous culture, fire ecology, and human development. Its conservation requires mitigating climate change, integrating indigenous agro-forestry practices with science, preserving Mangyan culture, conserving biodiversity, and encouraging community participation. Management success of a mountain grassland landscape like the MIBNP is therefore an achievement in genuine cooperation and governance among a variety of stakeholders.



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# Environmental and Social Impacts of Large Scale Hydroelectric Projects in Kinnaur a Tribal District of Himachal Pradesh in Western Himalaya (India)

*Haresh SHARMA, Mir JALAL (*India*)*

Abstract All the hydroelectric projects in Kinnaur district have been given all attention regarding its technical design and economical issues of the project and very least or almost negligible attention on social and environmental factors. The Satluj River is extremely rich in hydropower, with 4 large scale hydropower projects have commissioned and several others under construction and planned. The Construction and operation of dams have always been associated with changes in the social, physical and biological environment. Some of the negative impacts of hydroelectric projects include loss of vegetations, topographical disturbances, changes in rivers flow patterns, involuntary resettlement, health problems, loss of cultural values and marginalization of local people. The deluge of storage dams constructed by hydropower developers in the tribal Kinnaur district of Himachal Pradesh, bordering Tibet has not only caused damage to the ecosystem, but also threatened the rich culture of tribal. The construction of large hydropower projects have been polluted the land and water, glaciers are melting fast, rivers are vanishing, underground tunneling and reckless blasting have become a bane for people in many villages, but more serious fallout is that power developers are usurping the lands of tribal community. The development as power projects have badly affected agriculture, horticulture, bio-diversity, rivers system and blasting has shaken the mountains trigging landslides during rain and snow. It includes physical and social impacts that cover many aspects of nature and human society. The ecological fragile tribal areas of Kinnaur are facing disaster with hydro power projects, posing a threat to the environment, rivers, security and ethnic identity and culture of tribal. The construction of hydro power projects in earthquake prone seismic zone- IV has worried the tribal. The effects on the natural habitat are the biggest concern with run-of-river projects and reduction of natural water flow can change the quality of the habitats. Socially acceptable hydropower means that any proposal for a project must be discussed with stakeholders and adopted to their needs, and that successful negotiations must be concluded with affected local communities for a project to move ahead. Key Words: Hydropower Project, Environment, Tribal Community, Dam, Run-of-River



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## Aborigine cultural landscapes in the Arctic: present day status and protection measures

*Tatiana KRASOVSKAYA (Russian Federation)*

Increased economic development in the Arctic region is connected with many common problems for the circumpolar territory. Among them are geopolitical, ecological, economic, ethnic-cultural etc. The Arctic region became the arena of close contacts of European and aborigine cultures. Vast changes in nature management patterns lead to almost total transformation of aborigine cultural landscapes which reflect indigenous peoples original world outlook including traditional knowledge of sustainable development patterns in the Arctic environment. A reduced cultural landscape concept is often used for the existing protection measures: sacral objects, traditional nature management lands in general etc. are mentioned in official documents. UNESCO Convention on natural and cultural heritage protection (1972) outlines what is necessary to protect as cultural landscapes though this term was not used at that time. Such practice exists in Russia for historical and memorial places. There is an urgent need to develop an advanced Federal legislation to provide protection of aborigine cultural landscapes as heritage objects. It must be mentioned that nowadays regional legislation is more advanced in this respect.



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# Landuse Rights of the Soliga Indigenous Communities in Male Mahadeswara Hills and Sathyamangalam Hills of Southern India

*Divya SWAMINATHAN (Germany)*

Many forests areas in India are inhabited by indigenous communities. The government has introduced policies and programs to improve their situation, however, with limited success. Indigenous communities living in forest use forest as a source for resources for their sustenance and livelihood. Indigenous communities apply a combination of multiple land-use systems such as agriculture, agro-forestry, forestry, and pasture. However, many indigenous communities are at the lower end of the social and economic order in India and do not have political decision-making power nor control over the land they use, particularly the forested areas. Most forests are under control of local governments and the lack of secure and proper land tenure rights makes it difficult for indigenous communities to adapt sustainable land management and livelihood systems. The research focuses on "how agricultural transformation and designation of Protected Areas impact on the land uses and livelihoods of the Soliga communities living in and around the Male Mahadeshwara and Sathyamangalam Wild Life Sanctuaries in Southern India?".Qualitative participatory appraisals have been used to derive narratives of the past and existing situations using semi-structured interviews, oral histories and participant observations apart from a literature review and GIS mapping of landuse resources in the study area.The main outcome of the research has been to understand the agricultural transformation processes and the drivers of land use changes of the indigenous Soliga communities and to recommend for more sustainable land use policies and implementation that better reflects the needs and concerns of the Soliga communities.



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## Governance of MPA and indigenous cartography in the western Caribbean

*Akiko IKEGUCHI (Japan)*

Marine Protected Areas (MPA) have been widely promoted as an institution for biodiversity conservation and fisheries management. In the coastal areas in the global south, where coral reefs are major ground both for biodiversity and subsistence activities, participatory approach to MPA is considered critical both in terms of effective conservation and democracy. Indigenous cartography is a vital practice in such approach, however, its dynamic process in MPA setting is poorly studied compared to technical aspect. In this paper, I will discuss changing practice of indigenous cartographies by fishers and their perception of ecosystem in current political context, drawing on the case studies in San Andres Island and Miskito coast in the western Caribbean. Interview to stakeholders and fishers were conducted in 2012-2014. In San Andres Island located at the border of Colombia and Nicaragua, growing population pressure, use of coastal water by tourism industry, and drug trafficking control necessitates territorial claim by indigenous fishers across the archipelago, whereas MPA is being discussed and implemented by unit of island. Their cartography is based on the scale used by their sailing technique and also ethnic identity as Raizal. On the other side of the border, MPA is being negotiated by indigenous Miskito people based on ecosystem concept and their cartography. The ecosystem concept extends from the turtle hunting ground to lagoon and forest, and the latter is gaining more significance as their resources are threatened by western farmers and ranchers.



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**Filmmaking, Collaboration and 'Decolonizing Methods' in PhD Research**

*Amber Murrey NDEWA (United States of America)*

Recent multidisciplinary approaches to expanding research methodologies, among them feminist collaborative methodologies and decolonizing or Indigenous methodologies, urge a (re)centring of relationships and collaboration in academic work. In this presentation, I explore a grounded, long-term methodological orientation that is attentive foremost to the voices and experiences of the people in the places where we research. Illustrating with a film I shot during research along an oil pipeline in Cameroon, I explore the use of film and the subsequent screening of that film as a means of memory making and collaboration. I address some constraints within institutional academic contexts, which are sometimes at odds with collaborative knowledge making by emphasising the primacy of the individual researcher. I end with thoughts on potential collaborations between Northern-based and Southern-based researchers.



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## Connecting past and present research in Northern Australia

*Siri VELAND (United States of America)*

This paper considers the role of past research and records about Aboriginal people living on Goulburn Island in northern Australia. The initial aim of this research was to understand experience of climate-related risks. In capturing such perspectives, the research included visits to the community and an examination of archival records kept by the Uniting Church since 1919, and a publication from 1974, Lamilami Speaks. These became two key points of engagement during visits to Goulburn Island. They contain very different accounts of life in the region, and research participants steered my interaction with them in two very different ways. The Mission records told of efforts to introduce Christianity and agriculture, and contained pictures of people and places, some of which included school pictures of current residents. These records were mostly met with great interest, and people shared stories of good and bad memories from the Mission. Lamilami Speaks was told by a man from Goulburn Island, Lazarus Lamilami, who became ordained in the Methodist Church, and written by the prominent Professor R.M. Berndt of the University of Western Australia, whose wrote extensively on Aboriginal life across Australia. This book contains detailed stories of life before and during the Mission, including secret ceremonies and knowledge, and I was cautioned in my use of this material. The caution relates not only to secret knowledge, however. Unclear and disputed interpretation and inheritance of property rights challenged ethical engagement with its stories. Missionary and research records such as these also serve as witnesses to the changing ways in which Aboriginal communities have been governed through different framings of human-environment relationships.



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## Giving Back - Geographic data collected in 1965 returned to an Indigenous community in a rural town in NSW , Australia

*David CREW, Richard HOWITT, Janice MONK (Australia)*

Geographer Janice Monk conducted a study of social conditions of Aboriginal families living in rural communities in NSW in 1965. Her research was part of a larger study undertaken by the Social Science Research Council of Australia that produced substantial policy change in Indigenous affairs. Monk's focus on economic and social well-being was reflected in the wider project, and its policy recommendation. This paper explores the process of returning Monk's household data to communities where she worked in 1965 and in particular in Deniliquin in southern NSW, Australia. This study is part of an Australian research Council Discovery Project being conducted by Richie Howitt for Macquarie University and Jan Monk form the University of Arizona. Building on the work from the mid-1960s, our current research explores the narratives that inform (or excuse) the policy failures that see the nation grappling with a situation where policy development where life expectancy of Indigenous Australians is 10 years less than non-Indigenous Australians (Commonwealth of Australia 2015), where imprisonment rates are 13 times higher for Indigenous Australians and unemployment is more than three times higher than for non-Indigenous people (ABS 2014). This paper reviews the issues associated with building long term narratives of change and disadvantage using data collected in earlier periods in contemporary research in collaboration with local communities. In particular, it reports on how addressing issues of research ethics, data integrity and community participation has reshaped the research methods used and the understanding of what drives and limits policy change over time.



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# Building Arctic Sustainable Communities to Protect Indigenous Rights in the Age of Climate Change

*Victoria HERRMANN (United Kingdom)*

Climate change is having a very real and immediate impact on indigenous rights such as access to health, stable residence, culture, and subsistence for communities that live in the circumpolar north. This paper contends that by investing and developing sustainable societies in the Arctic, national governments can alleviate indigenous rights issues induced by climate change. It will argue that by establishing nationally delegated, locally implemented sustainable development plans, Arctic countries can better assist some of their most at-risk communities adjust to the impacts of a changing climate. The research first surveys the scholastic links between climate change, environmental justice, and indigenous rights in the Arctic. It will connect national and international treaties to tangible indigenous rights concerns in Arctic communities exacerbated by climate change. These include decreased access to traditional food sources, dangerous condition for culturally important hunts, and increased violent coastline storms that force the relocation of entire communities. The piece will then move on to explaining the socio-cultural, economic, and environmental components necessary for effective sustainability plans, incorporating a diverse set of Nordic case studies. Finally, it will explore ways to create more national funding for local innovation; to build local technical capacity; and to construct effective project development and selection regimes. The United Nations has noted that respect for and endorsement of indigenous rights is a precondition for sustainable development. Correspondingly, supporting the development of sustainable societies can help relieve environmental injustice and safeguard indigenous rights.



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# C12.22 Islands

## Island Sustainability

**Chairperson(s):** *Andrey IVANOV, Ganzei KIRILL*

- Convivial island economics: Commoning on Pongso-no-Tau
  *Huei-Min TSAI, Eric CLARK (Taiwan)*
- The change of conservation of traditional springs : the case study of the Okinoerabu Island, Kagoshima Prefecture
  *Masatoshi MOTOKI, Go HAGIWARA (Japan)*
- High-scale studyingand mapping ofvegetationof southern part of the Kunashirisland
  *Natalia ALEXEENKO, Michail GRISCHENKO (Russian Federation)*

## Island Development and Global Change

**Chairperson(s):** *Andrey IVANOV, Ganzei KIRILL*

- Meta-analysis of Island Development—A Case study of Lieyu Island, Taiwan
  *Wen-Hua HUANG, Su-Hsin LEE (Taiwan)*
- Landscapes of Peter Great Bay Islands (Japan Sea)
  *Kirill GANZEI (Russian Federation)*
- The social response to climate change in Faaf- Magoodhoo, Maldives
  *Marcella SCHMIDT DI FRIEDBERG, Stefano MALATESTA (Italy)*
- South Georgia Island (Antarctic) in Postglacial Time
  *Nicolay DUNAEV (Russian Federation)*

## POSTER EXIBITION

## Island Development and Global Change

- Transformation of the Southeast Asian social and economic space in the process of integration of the region into the global information economy
  *Irina IVANOVA (Russian Federation)*



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## Convivial island economics: Commoning on Pongso-no-Tau

*Huei-Min TSAI, Eric CLARK (Taiwan)*

The Tau people of Pongso-no-Tau (Orchid Island, southeast of Taiwan) have for centuries practiced egalitarian commoning and sustainable coastal livelihoods. The island's pre-colonial history presents one among numerous instances supporting the claim that "for thousands of years people have self-organized to manage common-pool resources, and users often do devise long-term, sustainable institutions for governing these resources" (Ostrom, et al. 1999, 278). During the last century, however, two waves of colonial rule by Japan (1896-1945) and Taiwan (since 1945) have severely impacted the socio-ecological fabric of the island. This paper a) briefly outlines pre-colonial social practices of commoning and the convivial livelihoods of the Tau; b) analyzes processes and consequences of eco-colonialism and the introduction of money on Pongso no Tau, with emphasis on shifts in social practices and changing socio-ecological relations in the emerging tourism economy; and c) illustrates crucial spheres of Tau resistance and strategies to reassert their claim to island commons, building upon while adapting and developing Tau traditional knowledge, culture and customary law. We conclude with reflections on how the reassertion of social practices of island commoning on Pongso no Tau offers guidance as one exemplar (among many) of transtitioning towards convivial economics based on sustainable social relations and livelihoods. Key words: commoning, convivial economics, eco-colonialism, islands, Pongso-no-Tau, sustainable livelihoods



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# The change of conservation of traditional springs : the case study of the Okinoerabu Island, Kagoshima Prefecture

*Masatoshi MOTOKI, Go HAGIWARA (Japan)*

This study aims to understand the actual circumstances of the changes and the spring preservation management on Okinoerabu Island, an outlying island in the Kagoshima Prefecture, Japan. Regarding water resources, since Okinoerabu Island is one of the raised coral limestone islands, it has been historically difficult for residents to get water for their daily needs. There used to be more than 130 springs used for such needs as drinking, cooking, washing clothes and taking bath, etc. These springs can be found on the ground and inside caves leading to underground as well. It was one of the most important work for ladies and children to go to the springs and carry water pails back to their house every day. Because the local government (Chi-na Town and Wadomari Town) developed water supply system during early 1950s, most of the residents stopped using natural springs. Now there are only a few written records left of natural springs in Okinoerabu Island and it is feared that residents may forget their own history and live culture with those springs. This research is composed of basic research on springs. Since there are only few detailed record of springs, the main purpose of our research is to make clear the role of springs in communities, based on a list of names of springs and interviews with local residents. Conservation of traditional springs is necessary in order to maintain the harmonious relationship between hydrological environment and human activity in the Island.



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**High-scale studyingand mapping ofvegetationof southern part of the Kunashirisland**

*Natalia ALEXEENKO, Michail GRISCHENKO (Russian Federation)*

Due to its comparative isolated situation, the Kunashir island is still not deeply examined, despite the diversity and specific features of the natural conditions prevailing in this small area. On the Kunashir there were formed the plant communities that differ from the neighboring well-studied Hokkaido and Sakhalin. In July of 2014 in the southern part of Kunashir vegetation field research was lead. The base materials were also the satellite images of various spatial resolution and topographic maps. On the resulting map of the scale of 1:25,000 were allocated five major classes of plant communities: forest, woodland, meadow, elfin woodland, intrazonal. Further, the major classes of plant communities were divided into smaller sub-classes. Forests are divided into three categories: coniferous, deciduous and mixed. Among the meadows there were allocated three basic types: grasslands with elfin, sasa grasslands with trees and grasslands. Using the same principle the sparse woods were divided into those which include elfin woods and those where it is absent. As well as in the case of grasslands, it is because at high altitudes to woodlands admixes elfin woods. Analysis of the map confirms the dependence of vegetation on the terrain (zoning) and on the proximity to the coast (sectoral). There was also registered a bland exposition effect and the effect of steep slopes on the composition of plant communities. However, they are often disrupted by exposition and barrier effects, mesorelief and microrelief features, as well as human activities.



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**Meta-analysis of Island Development—A Case study of Lieyu Island, Taiwan**

*Wen-Hua HUANG, Su-Hsin LEE (Taiwan)*

Recently, affected by the rapid development between Kinmen and Xiamen Island, Lieyu, although is one of Kinmen Islands, positively accelerated its' development. Moreover, the Kinmen Bridge connecting Lieyu and Kinmen will be completed in 2017. Dadan and Erdan Islet where are two mysterious Cold War Islets open soon for sightseeing. Meanwhile, Lieyu Island was positioned the designated port for entering these islets. Therefore, local government of Lieyu is poised to expand the island development. Local government's goal is to let the rural and bordering Lieyu Island to form a Tomorrow's Pearl of island development. Our purposes are to clarify: what is the island development, the context of Lieyu development, the influencing factors of Lieyu development, the issues of current development, and islander's viewpoints of development. This study used the approaches of historical geography, place and development to probe. Ethnography is our methodology. Main methods are participant observation, interview and literature and achieve analysis. The results showed the island development is not only a reproduction of chronopolitics, but also a representation of social evolution by Western views. The context of Lieyu's development showed the Border Guard, the state-owned industry, migration, transport, etc. But these developments are not only chronological, but also in part simultaneous. Influencing factors of Lieyu's development on the national scale are national policy and the orientation of island development; on the regional scale are location of border, perceptional stimulation of different islands, financial resources of local government, relationship with the surrounding islands; on the locale are the environment of Lieyu island, Village's scale and clans, politicians and industry, the competing of public sectors. Currently, the issues of Lieyu development are the construction of Kinmen Bridge, medical and ferry, ideas of the tourism, drift garbage from sea, public sector's views of construction, military released land, perceptional stimulation of rapid development of Xiamen Island, the role of national park, handling of military sites of Cold War.



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**Landscapes of Peter Great Bay Islands (Japan Sea)**

*Kirill GANZEI (Russian Federation)*

At present time on social and economic development of island territories of Peter the Great Bay focused high attention. Realization of large infrastructure projects and planning of future development leads to essential change of landscape structure of the territory. Within works features of the landscape organization, manifestation of landscape forming factors and formation of modern landscapes of the islands of Peter the Great Bay are studied. On the basis of application of methods of complex physic-graphical researches landscape mapping, the description of spatial structure of landscapes was executed, global, regional and local factors of landscape differentiation are defined. The quantitative analysis of indicators of complexity of landscape maps included calculation of an index of divisibility, coefficient of complexity, landscape entropy, a landscape diversity, etc. For the islands of Peter the Great Bay according to pollen and radio-carbon dates the paleo-reconstruction of vegetation is carried out, four natural existential changes in structure of landscapes during Middle–Late Holocene are defined. Structural transformations of landscapes were caused by change of the climatic condition and anthropogenic influence. High degree of dependence of landscape diversity from the area of the island is also shown. Decrease of an indicator of landscape diversity after increase in intensity of economic use of a territory has shown. Results of the present investigations have important values for the analysis of sustainability of island geosystems to natural and anthropogenic factors and working-out recommendations for sustainable development of island territories. The reported study was partially supported by RFBR (project 15-05-01419-a).



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## The social response to climate change in Faaf- Magoodhoo, Maldives

*Marcella SCHMIDT DI FRIEDBERG, Stefano MALATESTA (Italy)*

The general targets of our research are the understanding of the social response to climate change within the insular Maldivians communities; the analysis of behaviours and practices through which local communities cope with long-term environmental changes; the evaluation of the concrete impact of behaviours, practices and education upon local environmental policies; the discussion of the social roles played by women within small communities affected by global environmental changes. The research has been taking place in Faaf Magoodhoo (Rep of Maldives). We investigate how local communities deal with climate change and the socio-economic role played by women considered as strategic stakeholders, and then, indirectly, evaluate the concrete impact of practices and believes disseminated both through local policies and through Environmental Education (EE) and Education for Sustainable Development (ESD) programmes. Collective response to environmental changes is strictly connected to the public roles people play within local communities. According both to this general statement and to the values of the "Climate Justice" we focus our research mainly on women living in Magoodhoo. In fact women are key actors both for the island social structure and its economic balance, being formally in charge of pupils education and of many cultural and political issues. However - at the same time - women are the most vulnerable members of this community because they are traditionally forced to stay in Magoodhoo and they rarely have the permission to move to Male or to foreign Countries for study or work.



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# Transformation of the Southeast Asian social and economic space in the process of integration of the region into the global information economy

*Irina IVANOVA (Russian Federation)*

The transformation of the social and economic space in Southeast Asia in the process of the integration of the region into the global knowledge economy could have different forms: population and production concentration and deconcentration, development of linear, areal and complex elements of the territorial structures, and it is largely determined with the geographical nature of the countries and the region as a whole. In the Republic of the Philippines (the most territorial desintegrated state in the world) a national integrated system of highways and ro-ro ferry routes (Strong Republic Nautical Highway – SRNH) was built in the early 21-st century, linking all parts of the archipelago with meridional and latitudinal routes. The SRNH helps national and foreign investments to meet local human resources, provides an the national and international markets access for local agricultural production, creates conditions for small and medium firms integration into transnational production and distribution chains. Thus the SRNH becomes the key part of the regional industrial clusters (agricultural, tourist, health and wellness, service and informational, manufacturing) development, aimed at improving competitiveness of the country. Absolute and relative growth of the urban population in Southeast Asia leads to the formation of giant urban regions. In the West Java the growing Jakarta metropolitan areal is merging with the Bandung agglomeration, forming an urbanized region with 45 million population. In the East Java the Greater Surabaya is the second urban pole. The Greater Semarang agglomeration is growing between them on the north coast. The transportation corridor between all large cities in Java is now modernizing to provide high speed connection. Thus the urbanized corridor Jakarta – Bandung – Semarang – Surabaya is forming on the island, with branches to Yogyakarta and Malang. The concentration of modern manufacturing and service (including research, education, transport and trade) zones in this corrifor has to increase the investment attractiveness of Indonesia. Active processe of bilateral and multilateral economic integration in Southeast Asia leads to the advanced development of cross-border territories. A growing international economic region is developing in the zone of the Strait of Malacca including Singapore, Malaysia, Indonesia and Thailand territoties, which could become one of the largest nuclei of the global economy.



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# C12.23 Karst

## Sustainable Development in Karst Environments 1

**Chairperson(s):** *Elena TROFIMOVA, Hong LIU*

- The main contamination patterns of karst water in Kunming Karst Faulted Basin, Yunnan, China

  *Hong LIU (China (Beijing))*

- Local Geomagnetic Variations As A Possible Search Indication Of The Karst Caverns And Taliks

  *S. RYABOVA, A. SPIVAK, Dmitry LOKTEV (Russian Federation)*

- Formation of the Large Constructive Waterfall by mixed-corrosion effects

  *Jie ZHANG, YK ZHOU, JK DU, SF LI, XS WANG (China (Beijing))*

## Sustainable Development in Karst Environments 2

**Chairperson(s):** *Elena TROFIMOVA, Hong LIU*

- Karst dynamic system and the Carbon Cycle

  *Jianhua CAO, Bill Hu, Chris GROVES, Fen HUANG, Hui YANG, ChunlaiZHANG (China - USA)*

- Palaeolothic paintings conservation in cave Kapova (Shulgan-Tash)

  *Yury LYAKHNITSKY (Russian Federation)*

- Karst of the valley of Synyaya: problems of sustainable development (Yakutia, Russia)

  *Elena TROFIMOVA (Russian Federation)*



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IGU 2015 – 4429

**The main contamination patterns of karst water in Kunming Karst Faulted Basin, Yunnan, China**

Hong LIU (China)

Kunming karst faulted basin is located in three river watershed zone of the Yangtze River, the Honghe River and the Pearl River, with an area of 2,920 km2. Kunming, the capital city of Yunnan province, is located in the middle of basin. Karst groundwater plays an important role for social and economical development in the area. With the rapid increase in population and expansion of urbanization, the groundwater quality has stuck around by sudden pollution incidents. The routine water analysis, twice a year in wet and dry seasons respectively, shows most of karst spring water qualities are still good, though the water chemical compositions may exist obviously differences in two seasons. Our research has revealed at least exist following special contamination patterns which are threat to karst groundwater quality: 1. the pulse contamination: a kind of contamination is caused by illicit or accidental sewage discharge from institutions or factories. Normally, the peaks of contaminant concentration are high and last 5-8 hours depending on the distances of injection point to springs. 2. The episodic contamination, it happens to a certain degree associated with heavy storms in summer time. The overflow of sewage or liquid fertilizer tanks flow into karst sinkhole. The pollution could be last 3-5 days. 3. Seasonal nonpoint contamination: is the most common pollution type, caused by the coincident of density agricultural activities in recharge areas with wet season.



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IGU 2015 – 1382

## Local Geomagnetic Variations As A Possible Search Indication Of The Karst Caverns And Taliks

S. RYABOVA, A. SPIVAK, Dmitry LOKTEV (Russian Federation)

Local variations magnetic tipper are determined particularly by change of medium electric conductivity. Karst caverns and taliks contain increased abundance of the water. It changes electric conductivity in comparison with surrounding medium. In this work we considered variations of the magnetic field at the Earth's crust surface and its relation to change of the groundwater regime at the middle latitude geophysical observatory "Mikhnevo" of the Institute of Geospheres Dynamics of Russian Academy of Sciences [1]. We used the results of synchronous measurements of the magnetic field at the Earth crust surface and the underground water level in water-table aquifer (in this case water level variations are equivalent variations of thickness of water layer, that is effective conduction of the upper Earth's crust plots). Estimation of strength dependence between two rows (magnetic tipper and underground water level) was carried out using criterions of linear Pearson correlation and rank Spearman and Kendall correlations. Pearson's (KP), Spearmen's (KS) and Kendall's (KK) correlation coefficients are: (KP) = - 0,85, (KS) = - 0,95, (KK) = - 0,78 (statistical significance r J 0.05). It testifies about significant correlation between analyzed rows. Additional test of statistical significance of correlation ratio carried out using randomized rows confirms significant negative correlation between local magnetic tipper variations and seasonal variations of the underground water level of water-table aquifer. [1] Adushkin V.V., Spivak A.A., Gorbunova E.M. etc. Synchronous variations in the Earth's magnetic field and groundwater level. Doklady Earth Sciences. 2013. Vol. 449. Part 2. P. 427-429.



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**Formation of the Large Constructive Waterfall by mixed-corrosion effects**

Jie ZHANG, YK ZHOU, JK DU, SF LI, XS WANG (China)

Since the constructive waterfall were first found by Gregory (1911) in Plitvice, the karst constructive waterfall formed by the process of precipitation of travertine and tufa in the river channel were identified in many sites of the world. In China， Jiuzhaigou National Park, a World Natural Heritage Sites and one of the most famous tourist attractions is typical case with dammed lakes and constructive waterfalls. More than a hundred of lakes and dozens of waterfalls were identified ether of karst genetic or non-karstic (collapse, debris flow, glacial, and tectonic fault driven etc.) genetic, yet the dominant type is karst genetic. Through field observation, we identified that bio-karst processes played important role in regional surface karst corrosion and also in precipitation of calcite and the related tufa formation. Algae and lichen may cause direct bio-erosional micro-relieves on limestone surface. On the other hand, other algae （like diatom and cyanophyta as well as green alga）, mosses and bushes promoted the calcite precipitation in the river by respiratory effect, nuclearation effect as well as shoring effect to construct waterfall with tufa deposition. Two extraordinary large scale constructive waterfalls in Jiuzhaigou should be the natural wonder not only because of its attractive beauty but also because of their large-scale and occurrence in channels. Though the height of the water fall cliffs are about 20 m, which is a little bigger than normal, yet the widths those two falls are about 200m. Since the location of two falls are on the confluence of the river joints, so many hypothesis on the formation were proposed. Two famous of those interpretations are the debris flow driven and the fault oriented. We pointed the improperness of these interpretations and propose the mixed –corrosion driven theory for the formation of such large falls with field hydro-chemical data and the geomorphomic analysis on the profile and extension of the tufa accumulation structure of waterfalls landforms, and pointed out that the waterfalls are in a dynamic balance with the mixed corrosion in the foot of waterfall cliff and the biogenetic tufa accumulation of the up part of the waterfall cliff.



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## Karst dynamic system and the Carbon Cycle

Jianhua CAO, Bill Hu, Chris GROVES, Fen HUANG, Hui YANG, ChunlaiZHANG (China - USA)

Karst dynamic operation mainly includes carbonate rock formation and its dissolution and weathering. The carbonate rocks' formation made great contribution to atmospheric CO2 sink in geological age, as the result of the processes, the concentration of CO2 reduced from over 25% in primitive atmosphere of ancient earth to only 0.03-0.04% in modern atmosphere. The carbon stored in carbonate rocks, which amounts to 61×1015t, is known as the largest carbon pool on modern earth, representing 99.55% of the global carbon storage. In modern karst dynamic system, there evidences show the carbonate rock dissolution and weathering actively involves in the global carbon cycle, and sensitively responds to climate and environmental changes, the annual carbon sink flux derived from carbonate rock dissolution amounts to 0.36-0.44 PgC/a, which is close to the figure of 0.477 PgC/a, accounting for 32.73-40.00% of global forest carbon sink of 1.1 PgC/a from 1990 to 2007. This figure equals 45.00-55.00% of net carbon flux for global soil organic carbon pool under appropriate management. Finally, this paper gave the conceptual model of Karst Carbon Cycle in Watershed, consisting of three parts: carbonate rocks dissolution removing the atmospheric/ soil CO2 to water and to produce inorganic carbon; inorganic carbon transfer and conversion along with water flow; inter-conversion between inorganic carbon and organic carbon with the aquatic plants photosynthesis, part of the organic carbon deposit on the river/lake/reservoir beds mixing with sediments.



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**Karst of the valley of Synyaya: problems of sustainable development (Yakutia, Russia)**

Elena TROFIMOVA (Russian Federation)

Valley of Synyaya (the claster of the Natural Park "Lena Pillars" /NPLP/) is situated on the left hand of the great Siberian River Lena. In July 2012 NPLP was inscribed at the List of World Natural Heritage but without Synyaya claster. The region belongs to the northern part of Prilenskoe Plateau, raised at 400-500 m a.s.l. Climate of territory is Sub-arctic extreme continental and dry: average annual temperature of the air is 10,7°C at the annual temperature amplitudes to 89,9°C. Average annual precipitation reaches 335 mm. There is area of continuous permafrost to 600 m thickness. Carbonate rocks dated from Lower Cambrian outcrop here. Karst phenomena have a wide spread in the frame work of the valley of Synyaya: karren, sinkholes, dry valleys, caves, etc. Starting from 2011 the Valley of Synyaya are increasely modified by human activities, especially the Valley of Byllyakh (right tributary of River Synyaya). Gabbro-diorite mine, deforestation, road from the settlement Sinsk to the mine are resulting in potentially irreversible changes in karst environment. In light of sustainable development of region considered it is expedient and timely to focus the human stewardship on the preparation of separate nomination for the Synyaya claster with the aim to include this territory at the List of World Natural Heritage.



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# C12.25 Landscape Analysis and Landscape Planning

## Results and Problems of landscapes Planning and Landscape Governance

**Chairperson(s):** *Kirill CHISTYAKOV, Ashot KHOETSYAN*

- Landscape planning on the basis of geosystem theory

  *Vladislav SYSUEV,, I. V. MIRONENKO, YU.V. LOGUNOVA, B. I. KOCHUROV, S. K. KOSTOVSKA, N. M. ERMAN (Russian Federation)*

- Geographical principles of landscape planning

  *Alexander KHOROSHEV (Russian Federation)*

- Assessment of Landscape Potential of Moscow for Land-use Planning

  *Vyacheslav NIZOVTSEV (Russian Federation)*

- Assessment of the geoecological state of landscapes basing on their assimilation potential

  *Emma ROMANOVA, Anton BULOKHOV, Marina ARSHINOVA, Ali ALYAUTDINOV (Russian Federation)*

## POSTER EXIBITION

## Results and Problems of landscapes Planning and Landscape Governance

- Analysis Of Landscape And Geophysical Differentiation Of Inner Ridge Of Crimean Mountains

  *Olga YAKOVLEVA (Russian Federation)*

- Landscape analysis for environmental planning, management and decision-making by oil-and-gas field development: experience from Western Siberia, Russia

  *Alexander MARSHININ, I.R. IDRISOV, V.V. KOZIN, D.M. MARINSKIKH (Russian Federation)*

- Study on landscape classification and ecological restoration strategies of Shangyi county

  *Ma LI (China (Beijing))*

- Landscape planning for cognitive tourism development in federal partial reserves (zakhazniks) of Russia

  *Vera CHIZHOVA, Ekaterina SHLYAKOVA (Russian Federation)*



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IGU 2015 – 2768

## Landscape planning on the basis of geosystem theory

Vladislav SYSUEV (Russian Federation)

Modeling of the structure and functioning processes allows to create schemes of landscape planning for long-term sustainable forest management and zoning geosystems in order to localize quickly hydrological processes. The investigation site was in southern taiga within the marginal zone of Würm glaciation in European Russia. The structure of natural complexes was described by quantitative classification based on morphometric parameters, digital terrain model and space image. Classification of relief was performed using parameters that describe gradients of geophysical fields of gravity and solar radiation. Landsat 7 data were used to decipher plant cover patterns. Classes were verified by field data from forest inventory using discriminant analysis. Modeling long-term dynamics of the uneven stands conducted using the two most contrasting scenarios - the natural development of forests and continuous felling. The simulation results as a basis for zoning on the recommended methods of forest management. Landscapes hydrological functioning was researched on the small watershed with boggy forest and represents limnoglacial landscape. Calculation of flow was made in GIS SAGA (Böhner, et. al., 2004) exclusively under the apri-oristic data. Modeling of the landscapes structure has allowed to set the distributed parameters of watersheds, such as factor of a roughness "Manning's n", factor of "Curve number", et al. The calculate data of flow rate has shown, that the tabular values allow to reveal essential distinctions in distribution of runoff rates in various geosystems. Field measurements of runoff have been spent for verification of calculations data. Modeling of surface runoff based on the geosystems structure enabled a watershed zoning on time lag until discharge lines.



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## Geographical principles of landscape planning

Alexander KHOROSHEV (Russian Federation)

Essence of geographical approach to landscape and territorial planning requires paying priority attention to consideration of relations between components and spatial subsystems in a landscape. Landscape planning decisions should aim at maximum possible adaptation of economic activity to landscape pattern and minimization of ecological and social conflicts between stakeholders. We argue that multistructural organization of space force to apply simultaneously various models of landscape pattern involving concepts of landscape-morphological unit, basin, catena, matrix. We propose 15 more or less universal rules for landscape-planning decision that contribute to supporting landscape diversity, emergent effects of spatial pattern, geometrical properties of landscape units, lateral interaction and distribution of anthropogenic loads in space and time. Rules were formulated in short as follows. 1) Adapt activity to landscape pattern in support natural self-regulation. 2) Protect rare units and concentrate loads in typical ones, in already disturbed in particular. 3) Disturb areas not larger than natural disturbances and simulate natural mosaics. 4) Protect ecotones and consider their multifunctionality. 5) Regulate spatial ratios of landscape units to ensure emergent properties. 6) Compensate disturbances by protecting or restoring similar distant units. 7) Optimize shape and size of units depending on main ecological values. 8) Restrict loads with consideration to distant effects. 9) Create or protect buffer strips between dangerous flows and vulnerable objects. 10) Minimize dispersion of undesirable flows. 11) Locate vulnerable object outside impact zone of dangerous object. 12) Avoid unnecessary fragmentation of natural units. 13) Locate incompatible activities in opposite sectors of the planned area. 14) Preserve alternative resource instead of lost ones. 15) Consider long-term natural trends.



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## Assessment of Landscape Potential of Moscow for Land-use Planning

Vyacheslav NIZOVTSEV, I. V. MIRONENKO, YU.V. LOGUNOVA, B. I. KOCHUROV, S. K. KOSTOVSKA, N. M. ERMAN (Russian Federation)

The major purpose of complex landscape–geoecological studies was recognition of landscape–ecological potential of the Moscow area for land-use planning. Measures required for balanced and efficient development of the city area for comfortable life of population, nature protection and objects of cultural heritage, taking into account relationships between Moscow and Moscow Region, are proposed. An important feature of the Moscow Region is the fact that throughout its history it developed against a background of traditional Russian urban-planning culture as an integral cultural–natural system. Therefore, one of the main tasks of city-planning in Moscow within its new borders is conservation of both united landscape system and integrated historical and cultural space. The theoretical foundation of studies is the concept of landscape planning based on objectively existing local and regional physiographic differentiation, landscape structure, and functional zonation of the territory, which takes into account spatial distribution of landscapes and various grounds differing in special-purpose destination and use. A means for resolution of this problem is landscape mapping displaying differentiation of terrain and limiting factors of city-planning development. A series of original 1: 50000 scale maps for the entire Moscow area is produced for the first time; it includes «Landscape Map of Moscow» and «Map of the Nature Conservation Framework,» maps of landscape–historical grounds and complexes, summary analytical maps of "City-planning" and «Modern Landscapes.» Proposition for efficient use of the Moscow area and disposition of objects of capital construction taking into account landscape conservation purposes are developed.



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IGU 2015 – 0922

## Assessment of the geoecological state of landscapes basing on their assimilation potential

Emma ROMANOVA, Anton BULOKHOV, Marina ARSHINOVA, Ali ALYAUTDINOV (Russian Federation)

The geoecological state of landscapes depends on the type and intensity of anthropogenic impacts and ability of landscapes to sustain them. Among the indicators used for the geoecological assessment the assimilation potential (AP) reflecting landscape capacity to neutralize waste is important. It is calculated basing on the area of forests and wetlands which perform the regulating services. The AP value compared to the amount of emissions (CO2Eq.) provides the degree of adequacy of the assimilatory functions of landscapes. The method is illustrated by the assessment of landscapes of the British Isles. In 2014 total absorbing capacity of forests of the British Isles was 6.805 MMTCO2Eq. Inland waters cover 0.01% of the territory and their assimilating role is minor. The main sources of CO2 emissions are industrial, transport and waste management facilities. Emissions of 163 enterprises in Great Britain produce 254.7 MMTCO2Eq. and 20 enterprises in Ireland – 17.8 MMTCO2Eq. Transport emissions are 122 MMTCO2Eq. About 72.8 mln tons of solid wastes are collected in the British Isles and their processing produces 4.2 MMTCO2Eq. Spatial pattern of CO2 sequestration in landscapes is extremely varied. In terms of these indicators landscapes are classified into two groups: with surplus AP (creditors) and with AP deficit (debtors). Landscapes-creditors have AP higher than required for neutralization of produced emissions; positive biotic regulation of the carbon cycle is characteristic to them. Landscapes-debtors have AP lower than emission amounts. According to the calculations the majority of landscapes in England are debtors, not capable to neutralize wastes completely any more. The results of calculations are presented in a series of maps.



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IGU 2015 – 2395

## Analysis Of Landscape And Geophysical Differentiation Of Inner Ridge Of Crimean Mountains

Olga YAKOVLEVA (Russian Federation)

Landscape-geophysical differentiation is the result of uneven distribution of different types of energy on the earth's surface. Against the background of differentiation of larger systems open differences at microcomplexes allocated within geosystems of various ranks. There are still gaps in the methodology of the study of this heterogeneity, and therefore there are difficulties in solving a number of geoecological problems. One of the factors the loss of information about the differences at the micro level is the use of cartographic approach to the allocation of facies and other landscape units, which implies some kind of generalization of data. The consequence of such simplifications in information visualization is a false idea of the real natural territorial complexes. To implement landscape-geophysical analysis of selected areas within the Inner ridge of different scales: the western part of the ridge (1:200 000), between the river Bodrak and Kacha (1:50 000), the Valley Ashlama Dere (1:10 000), key areas (1:1000). It will allow us to identify the leading landscape-geophysical processes at different levels. The Inner ridge of the Crimean Mountains is the optimal model for the study of such differences as this area is characterized by a wide variety of landscape conditions caused by geology, topography, climatic large spatial gradients. Exposition differences are particularly striking as well as differences related to slope microzonal. Exposition differences affect the transfer of matter and energy. According to the source and the natural impact there are three main types of exposures: insolation, circulation, gravity. The study of landscape-geophysical processes on topical level will enhance the information content of such studies at the regional and macro levels.



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**Landscape analysis for environmental planning, management and decision-making by oil-and-gas field development: experience from Western Siberia, Russia**

Alexander MARSHININ, I.R. IDRISOV, V.V. KOZIN, D.M. MARINSKIKH (Russian Federation)

In applied research landscape analysis is considered with the following items: 1) a synthetic layer integral physiographic information about the natural environment; 2) an information basis for mapping and evaluation components of landscapes; 3) an basis for the assessment of natural resource potential; 4) a tool for assessment of ecological potential (functions, services, values, stability); 5) a tool for identifying ecological network. The procedure of landscape analysis and structure of landscape information system for decision-making by oil-and-gas field development are considered. The major methods is landscape classification and mapping. The classification of typological landscape complexes represents their typology based on the most important and common for this level of dimension features. The basic units of landscape mapping in mesoscale are the type of terrain (mesochores) and the type of urochishche (microchores). These landscape complexes were characterized based on collection of signs (geology, relief, permafrost, soil, vegetation etc.) using GIS. The evaluation of a landscape based on the concepts of landscape functions and services. The landscapes carry out resource functions (tree-resource, mushrooms, hunting-trade, ren-pascual et al.) defining an economic value. The landscapes also fulfil nature protection (ecological) functions: habitat (biotop), climate protecting, water protecting, water storage, runoff regulative, permafrost-stabilizing etc. The assessment of landscapes stability is carried out in two directions: related to mechanical impact and to chemical impact. Integral assessment of ecological characteristics (landscape functions and services, nature protection value, resource value, stability) is the base for environmental constraints map.



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## Study on landscape classification and ecological restoration strategies of Shangyi county

Ma LI (China (Beijing))

Study Area: The area of this county is about two thousand six hundred and thirty two square kilometers, the total population here is one hundred and ninety thousand, the mean altitude is about one thousand two hundred meters to one thousand five hundred meters. The annual precipitation is about three hundred fifty millimeters to four hundred millimeters. Shangyi county which belongs to farming—pastoral zone, located in the southeast edge of Innermongolia plateau, northwest of Hebei province, China. Background: The topic discussed the principles and methods of landscape classification on the basis of related theories of integrated physical geography and landscape ecology. Based on the total differences reflected in the alteration and interaction of physical factors (such as climate, geomorphy, soil and vegetation) and human factors (such as land use) in Shangyi county, we take geomorphy and land use type as the key indicators to classify the landscape of this county. Methods: There are two interrelated ways of landscape classification: the "top down" division and the "bottom up" subsumption. Combining site of the two ways is the senior land unit: land system type, along with field verification. Classification: The landscape classification hierarchic system is composed of two levels. At the first level, the county's landscape is divided into 8 categories, which are further divided into 23 sub-categories at the second level. The 8 landscape categories: Ⅰ .Grazing and farming landscape on the river and lake beaches. Ⅱ . Farming, grazing and forest landscape in the low-relief terrains. Ⅲ. Grazing, farming and forest landscape on the high plateaus. Ⅳ. Grazing, forest and farming landscape on mountains on the edge of the high plateaus. Ⅴ. Farming, grazing and forest landscape in the river valleys. Ⅵ. Grazing, forest and farming landscape on the rocky hills Ⅶ .Grazing and farming landscape on the loess tablelands Ⅷ. Forest, grazing and farming landscape on the lightly eroded, middle sized mountains Significance: Corresponded with the natural conditions and environmental problems of each landscape category, the ecological restoration strategies are proposed under the guidance of landscape planning theories and methods, which may act as reference for the environmental rehabilitation, ecological restoration and protective measures against environmental degradation.



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# Landscape planning for cognitive tourism development in federal partial reserves (zakhazniks) of Russia

Vera CHIZHOVA, Ekaterina SHLYAKOVA (Russian Federation)

The report discusses the landscape planning of the territory of federal partial reserves of Russia for the purpose of cognitive tourism development. Currently, most domestic and foreign publications on tourism development in protected areas, concern primarily national parks, much less objects of strict protection, including strict nature reserves (zapovedniks). And there are almost a few articles about how to develop tourism in the partial reserves. Meanwhile, their tourism development has recently hastened. This particularly applies to federal wildlife refuges, which are transferred under jurisdiction of state strict nature reserves. As an example we discuss Altacheiskiy partial reserve, created in 1969 in the Republic of Buryatia and placed under jurisdiction of Baikal biosphere strict nature reserve in 1985. In 2014 scientific workers and students of the Geography Department of Moscow State University named after Lomonosov held landscape ecological research on trail planning in it. It was defined for each trail stimulating and limiting factors important for development of the tour, period of visiting, possible recreational pressure, rules of conduct, special equipment, information saturation, etc. As a result detailed recommendations were developed for tourist and recreational development of the reserve. They provided also fulfilling its main functions on: protection, recovery and reproduction of wild animals and birds. The results of researches can be used not only within the Baikal natural territory, but also throughout Russia.



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# C12.26 Land Use and Land Cover Change

**Problems and consequences of land use/land cover changes: 1 Land Use/ Cover Change for sustainable future (long-term analysis, geospatial data, drivers)**

**Chairperson(s):** *Ivan BIČÍK, Elena MILANOVA*

- Prioritizing research on land use change in East, Southeast and South Asia for the Earth's Future

  *Yukio HIMIYAMA (Japan)*

- Two centuries of land use changes in Czechia

  *Ivan BIČÍK (Czech Republic)*

- Dynamics of Productivity in the Forest-Steppe and Steppe zones of the Former Soviet Union Countries During 1982 - 2014

  *N.M. DRONIN, O.N. TELNOVA, A.P. KIRILENKO, E.V. MILANOVA, N.N. KALUTSKOVA (Russian Federation)*

- The European objective of "zero land take" by 2050 and the tricky issue of its monitoring: overviews from the case-study of Luxembourg

  *Antoine DECOVILLE (Luxembourg)*

**Problems and consequences of land use/land cover changes: 2 Agriculture as important Land Use / Cover Change driver**

**Chairperson(s):** *Ivan BIČÍK, Elena MILANOVA*

- Identifying the phases of Indian Agriculture towards Desertification along Forest Fringe, of Karnataka State, INDIA

  *Arun DAS S, Koichi KIMOTO (India)*

- Modern development of agricultural regions: driving forces, regional pattern changes and land use conflicts

  *Alexey NAUMOV (Russian Federation)*

- Climatic Changes and Dynamics of Agricultural Land-Use Management in the European Russia

  *G.D. MUKHIN, N.B. LEONOVA, T.A. BOLDANOV (Russian Federation)*

- A new paradigm for evaluation of the Soviet Virgin Lands Campaign

  *Grigoriy KAZACHKOV, Sergey LEVYKIN (Russian Federation)*

- Forest transitions in Eastern Europe and their effects on carbon budgets

  *Alexander PRISHCHEPOV, Tobias KUEMMERLE, Jed KAPLAN, Ilya RYLSKY, Oleh CHASKOVSKYY, Vladimir TIKUNOV, Daniel MÜLLER (Germany)*



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**Problems and consequences of land use/land cover changes: 3 Strategy of Land Use/Cover Change in Urban Areas**

**Chairperson(s):** *Ivan BIČÍK, Elena V. MILANOVA*

- Changes in urban fabric of Bratislava during 2006-2012 in the context of the Urban Atlas Project
  *Jan FERANEC, Robert PAZUR (Slovakia)*
- Sustainable Land Use Strategies for Germany – Simulation and Evaluation of Urban Growth Scenarios including Climate Change Mitigation and Adaptation
  *Johanna FICK, Roland GOETZKE (Germany)*
- Historical Land-use/Land-cover Change in Urban Protected Areas: The case of Moscow
  *Irina MARGOLINA, Oxana KLIMANOVA, Evgeniy Yu. KOLBOWSKY (Russian Federation)*
- Use of methodology of soil cover structure for the assessment of resource potential of ecosystems of Belarusian Polesye lowland
  *Aliaksandr CHERVAN, Andrew CHERNYSH (Belarus)*
- Monitoring the changing spatial form of Chengdu City based on satellite image time series
  *Yafei WANG, Jie FAN, Dong CHEN, Rui GUO (China)*

**Problems and consequences of land use/land cover changes: 4 Cross-sectoral (biophysical and socio-economic) LUCC drivers**

**Chairperson(s):** *Ivan BIČÍK, Elena MILANOVA*

- A Cross-sectoral Approach to Analyse Land Use in Germany
  *Johanna FICK, Horst GÖMANN, Peter KREINS, Roland GOETZKE (Germany)*
- Ecosystem services, human well-being and sustainable cities – results of comparative German-Russian research work
  *Diana DUSHKOVA, Dagmar HAASE (Russian Federation)*
- Land Use change impact on biodiversity and local ecosystem. A case study of Thohoyandou, Limpopo Province. South Africa
  Olujimi OSIDELE, Nthaduleni NETHENGWE (South Africa)
- Wasteland and Reserved Land around Forest: a crossroad of LUCC in India
  *Koichi KIMOTO, S. ARUN DAS, R.B. SINGH, R. MAHFUZA, P. SHARMA (Japan)*
- Climate Driven Land Cover Change and Violence in the Sahel
  *Lindsay ROGERS (United States of America)*



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**Problems and consequences of land use/land cover changes: 5 Land cover changes under specific ecosystem conditions and in different countries**

**Chairperson(s):** *Ivan BIČÍK, Elena V. MILANOVA*

- Land Use and Land Cover Changes on the Islands of Peter Great Bay (Japan Sea)

  *Kirill GANZEI (Russian Federation)*

- Integrated assessment of environmental quality of coastal regions of the Pacific Russia for land use planning

  *Victor ERMOSHIN (Russian Federation)*

- Geospatial Analysis for Long-Term Changes of Vegetation Fraction in Inner Mongolian Desert Steppe Region, China

  *Bayaer WULIANGHA. Aodenggaowa, Han WULANQIQIGE, Sun GUANGFU, Chen JIANBO (*China*)*

- Land Cover Change in West Africa – Changes and Consequences

  *Fatou B MANDIANG (United States of America)*

- Large scale land Acquisition in Ethiopia: Case of Karuturi Global

  *Mohammad ANWAR (South Africa)*

**Problems and consequences of land use/land cover changes: 6 Land cover changes' impact on Carbon stock (general approach and forest regions)**

**Chairperson(s):** *Ivan BIČÍK, Elena V. MILANOVA*

- Assessment of Soil Organic Carbon Stock under Different Land Use in the Sub-humid Eco-region of India

  *Poushali ROY, S. SREEKESH (India)*

- Hydrocarbon status of soils in landscapes

  *A.N. GENNADIYEV, Yu.I. PIKOVSKII , A.P. ZHIDKIN, R.G. KOVACH, A.S. TSIBART , M.A. SMIRNOVA, T.C. KOSHOVSKII , N.I. KHLYNINA (Russian Federation)*

- Forest change in the centre of Eastern European plane (the 19th-20th century)

  *Maria ARKHIPOVA (Russian Federation)*



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## POSTER EXIBITION

### Problems and consequences of land use/land cover changes

- Agricultural lands use dynamics in the Volga river delta from multitemporal remote sensing data

  *Elena BALDINA, Ksenia TROSHKO (Russian Federation)*

- Application of change detection techniques for land use analysis of Zapolyarnoye gas field

  *Paul KARGASHIN, Maria KARGASHINA (Russian Federation)*

- Land Cover Change in Northeastern North America from 2000 to 2014

  *Stephen YOUNG (United States of America)*

- Land Use and Land Cover Change in Northern Thailand (Nan province) during 1995-2012

  *Baicha WONGTUI (Thailand)*

- Anthropogenic transformation of sub-Mediterranean landscapes of Russia

  *Marina PETRUSHINA, Ksenia MEREKALOVA (Russian Federation)*

- Analysis of the expansion of the olive grove in the province of Jaén through cartographic sources

  *Pilar García MARTÍNEZ (Spain), A. Paniza CABRERA, J.D. Sánchez MARTÍNEZ*

- Comparison of simulation models in terms of quantity and allocation of land change

  *María Teresa CAMACHO OLMEDO (Spain), Robert Gilmore PONTIUS Jr. (US), Martin PAEGELOW (France), Jean-François MAS (MEXICO)*



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**Prioritizing research on land use change in East, Southeast and South Asia for the Earth's Future**

Yukio HIMIYAMA (Japan)

Land use study is widely and deeply related with the missions of Future Earth. In another words, its success is vitally important for the success of Future Earth, which is a new international framework of global change research. However, land use, which can be seen as a reflection of society, nature and their interaction on the land, is difficult to grasp without truly integrative and historical views. The present paper discusses priority themes and desirable directions of land use studies under the framework of Future Earth, with special focus on East, Southeast and South Asia. These regions have been experiencing rapid socio-economic changes in the last three or so decades and their interaction with the land to date, present and in the future are a great concern of these rapidly evolving regions.



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IGU 2015 – 2842

## Two centuries of land use changes in Czechia

Ivan BIČÍK (Czech Republic)

Two centuries of land use changes in Czechia Landscape of Central Europe was changed in last two centuries very deeply. We have relatively very detailed base of information thanking cadastral mapping (1: 2880) and following evidency in Cadastral Office. On this data was created database of land use structure (www.lucc.ic.cz) for eight categories and six time horizons (1845-1896-1948-1990-2000-2010). Evaluation of long term land use changes in Czechia was realized in new book: Land use changes in Czechia 1845–2010; driving forces, consequences, impact (Springer 2015). We can inform here only about main results: ► Long term development of land use in Czechia is characterized by transition of land use structure from local self-supplying level when (all village had to have all categories of land use for surviving) into typological regions with similar LUCC structure and its development; differentiation among them is relatively wide; ► Four break points in land use changes in last two centuries in Czechia played role: -1. last 10-15 years of 19th century ( first wave of technical revolution in agriculture); end of increase of agricultural and arable land size; - 2. 1948:„socialization" and central state planning: impact on landscape - second and third wave of technical and technological revolution; depopulation of the Czech rural landscape; biggest looses of arable land till 1990; - 3. 1990 wave of restitutions and privatization; deeper care given to landscape and Nature, process of suburbanization, opening border and accession Czechia in the EU – very differentiated impact on the landscape; agro-brownfields, „new wilderness", intensively used arable land in lowlands, afforestation in higher altitude;… - 4. Agricultural land market opened in Czechia (2012). New agricultural policy in the EU will open weight of outer driving forces in land use structure!



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## Dynamics of Productivity in the Forest-Steppe and Steppe zones of the Former Soviet Union Countries During 1982 - 2014

N.M. DRONIN, O.N. TELNOVA, A.P. KIRILENKO, E.V. MILANOVA, N.N. KALUTSKOVA (Russian Federation)

We studied the contribution of climate change and land management practices to the observed changes in forest-steppe and steppe ecosystems of the Former Soviet Union (FSU) from 1982 until 2014. While during the beginning of this period the area of study had been a part of the USSR, since 1992 it is divided between four independent countries: Moldova, Ukraine, Russia and Kazakhstan. The economic importance of this area is defined by the large-scale agriculture, which frequently takes over 50% of the lands, while some of the grasslands are protected from the economic activity. Alterations in land management practices have led to significant changes in land use in the region, with increasing area under agriculture during the early years of the study followed by falling yields and returning the land to grassland in the 1990s. This trend has been reversed once again in the early 2000s with increased state support and better integration into global food trade. Adding to the impacts from the economics, changed precipitation patterns has led to increased aridity in parts of the region. Corresponding trends in biological productivity of agricultural lands and grasslands were analyzed and mapped based on the derivatives of NDVI time series at a 8 km to 250 m spatial scale.



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# The European objective of "zero land take" by 2050 and the tricky issue of its monitoring: overviews from the case-study of Luxembourg

Antoine DECOVILLE (Luxembourg)

The consequences of the conversion of natural and agricultural land into 'artificialised' areas is considered with more and more attention. For instance, the European Union has defined an ambitious objective for the future concerning sustainable land use in its "Roadmap to a resource efficient Europe": to stop the process of land take by 2050. Several European countries have already targeted precise and quantified objectives in their national policy agendas. For instance, Germany has defined the objective to reduce land take to 30 hectares per day by the horizon 2020, whereas Luxembourg has set up the objective of 1 hectare per day for the same temporal horizon. Austria focuses on the more restricted issue of soil sealing. But what do these figures really mean, and do we really have the means to monitor in a relevant way the extent of the phenomenon of land take ? In this presentation, we would like, in a first step, to shed light on the fact that there is still an ambiguity between the concepts of land take, soil sealing and the building of land plots in the different policy documents that have been adopted at national levels. Second, we will compare the results given by 6 different databases which show very different levels of accuracy, for the case-study of Luxembourg. This comparison shows that the results diverge and even sometimes contradict each other when they are used to depict the dynamic of land take. At last, and through a comparison of the land take policies adopted in France, Germany, Luxembourg and Belgium, this presentation will highlight the fact that land-use policies are the product of very different contexts and relationships towards the land resource. The priorities that are followed are not the same, which makes it almost impossible to define a common strategy at the EU scale.



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# Identifying the phases of Indian Agriculture towards Desertification along Forest Fringe, of Karnataka State, INDIA

Arun DAS S, Koichi KIMOTO (India)

Indian agriculture is acclaimed from the dates of Indus civilization (2500 BC). Since this time until the day, there were tremendous expansion in terms of space and technology has taken place. Abrupt growth in technology took place past one and half century. Consequent to this development, the land which was brought under agriculture in the initial days of introducing agriculture for the first time had all feasible condition for agriculture, But the fact now is, all those lands are not possessing the same physical condition. Either it has lost the productive capacity or modified into semi agriculture land. This kind of serious transformation has been taken place especially in the fringe and periphery of the forest. On the basis of the lands capacity and interwoven characteristics seven phases of agriculture scenario has been identified. Most of the land is on the march of desertification. Identifying the stages and the phase of the agriculture scenario is most relevant from the point of view of forest management, food security at regional, national and at global level. Secondly decisive measure can put back the degenerating environmental condition into halt. GIS and Remote sensing applications have been used to identify the phases of agriculture.



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# Modern development of agricultural regions: driving forces, regional pattern changes and land use conflicts

Alexey NAUMOV (Russian Federation)

During past century typology and regionalization of world agriculture were considered important topics of geographical research. In XXI century modern changes in territorial organization of agriculture along with new opportunities of data collecting and processing recall the relevance of regional approach in agricultural geography. Agricultural development, driven by market economy, enables formation of regions, specialized on production of main food and other (fibers, oils) commodities for international and domestic markets. Basing on FAO statistics and cartographical data, we have defined on the world map 94 specialized agricultural regions. Some of these regions, mostly in developed countries, are stable; their specialization and boundaries do not suffer significant changes. In countries with growing markets regional structure of agriculture changes fast (e.g. recent 'soybean boom' regions in Brazil, Argentina and neighbor countries; grains producing regions of Russia). These changes depend on profitability of agriculture, especially in marginal parts of regions, and reflect fluctuations of prices for produced and imported commodities (variable costs). Moreover, in different parts of the world remain many agricultural regions of another kind. We refer to the regions with predominance of subsistence or low market value small-scale agriculture. The stability of these regions (e.g. Andean highlands, lowlands of South Asia) is explained by high degree of survival ability of peasant economy. Market economy impact there is low, being main driving force for changes demography, which influences saturation of the land carrying capacity. Both kind of regions create different networks, which interaction sometimes produces conflicts.



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## Climatic Changes and Dynamics of Agricultural Land-Use Management in the European Russia

G.D. MUKHIN, N.B. LEONOVA, T.A. BOLDANOV (Russian Federation)

Global climatic changes affect in different ways in regions of the Northern Eurasia. Meteorologic data show increasing annual average temperature for 1-1,5 0C and summer precipitation in XX-th century in the European Russia. During studied warm trend period (1970-2009) the climatic parameters had increased even more: an annual average temperature had increased 1,5-2 0C in the central and southern Non-Chernozem regions. The clear connection between annual average temperature and grain crops productiuvity has been detected with 0,6-0,75 correlation ratio in some regions. However the favorable for land productivity climatic trend had coincided with large-scale lands'withdraval in Non-Chernozem and South-East regions because of economic reasons. During 1990-2009 period crop areas had reduced in Non-Chernozem zone more than twice: from 28,8 to 13,2 mln ha, area of grain crops had decreased from 13,4 to 7,3 mln ha with 33% decrease for European Russia as a whole. Grain crops farming faces with short of warmth in Non-Chernozem and moisture and in South-East, so lands' withdrawal comes into collision with favorable climatic changes. Grain crops' productivity increases in the most part of regions, only some boreal oblasts with poor soils don't have positive productivity trends because of low agrotechnical level. As a whole agricultural lands' withdrawal is unreasonable exept for obviously non-productive lands. Taking climate warming into account it is necessary to return 30-35% abondoned lands into agriculture in regions with more fertile soils considering natural, social and economic factors. Returning productive lands in agriculture is an actual task for sustainable land-use management in Non-Chernozem regions whereas climatic changes give favorable background for this.



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## A new paradigm for evaluation of the Soviet Virgin Lands Campaign

Grigoriy KAZACHKOV, Sergey LEVYKIN (Russian Federation)

The Soviet Virgin Lands Campaign in 1950-s was the important political, geographic and social – economical event that changed the history course of the east part of steppe zone in Eurasia in a radical way . After 60 years, this campaign still defines the character and main course of steppe land use. In the last years there are new landscape aftermaths of total steppe ploughing, representing a geographical phenomenon in the beginning of 21 century - a scaled steppe self -rehabilitation to the level of ecosystem basis. To explain these processes according to new approaches is studied origins of the Virgin Lands Campaign, compared key options, explaining unprecedented scale of steppe ploughing for a short period of time. It is considered an evolution of scientific estimates of the Virgin Land Campaign from point of view different positions. It is offered own estimate on the basis of steppe models developed by us . According to positions of steppe models and formation of secondary steppes, it is offered a new paradigm to estimate the Virgin Lands Campaign as a certain nature – anthropogenic disaster led in the issue to regeneration of old steppe vegetation. Taking into account results of annual field researches, it is given data about a ploughing scale of renewed steppe vegetation within Russia and Kazakhstan in XXI century. Taking into account self-rehabilitation of steppe, fluctuation of macro - economical indexes and global climate change, it is offered again to discuss opportunity of rearrangement of agrarian load between natural zones in Russia. It is given arguments to advantage of a rural economy recovery, first of all, an arable farming in the forest zone of the historical heart in Russia.



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**Forest transitions in Eastern Europe and their effects on carbon budgets**

Alexander PRISHCHEPOV, Tobias KUEMMERLE, Jed KAPLAN, Ilya RYLSKY, Oleh CHASKOVSKYY, Vladimir TIKUNOV, Daniel MÜLLER (Germany)

Forests often rebound from deforestation following industrialization and urbanization, but for many regions our understanding of where and when forest transitions happened, and how they affected carbon budgets remains poor, for instance in Eastern Europe. We present a new assessment of historical forest change in the European part of the Former Soviet Union effects on carbon stocks. We homogenized statistics at the provincial level for AD 1700 to 2010 to identify forest transition years and forest trends and used LPJ dynamic global vegetation model to calculate carbon stock dynamics. Our results revealed that forest transitions in Eastern Europe occurred predominantly in the early 20th century, substantially later than in Western Europe. We also found marked geographic variation in forest transitions, with some areas characterized by stable or declining forest area. Our data suggests extensive deforestation in European Russia already prior to AD 1700, and even greater deforestation in the 18th and 19th centuries. Based on our reconstruction, cumulative carbon emissions from deforestation were greater before 1700 (60 Pg C) than thereafter (29 Pg C). Forest transitions led to a uptake in carbon over recent decades, with our dataset showing the smallest effect (<5.5 Pg C) and a more heterogeneous pattern of source and sink regions. This suggests substantial sequestration potential in regrowing forests of the region, a trend that may be amplified through ongoing land abandonment, climate change, and CO2 fertilization.



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## Changes in urban fabric of Bratislava during 2006-2012 in the context of the Urban Atlas Project

Jan FERANEC, Robert PAZUR (Slovakia)

According to the European Commission report in 1990-2000 daily 275 ha of soil was built-up in what was then the territory of the European Union. The area represents the loss of 1,000 km2 of soil a year. Although the recent trend is that of diminishment as it dropped to 252 ha/day, the urbanization still has the greatest impact on the soil component of the landscape caused by human activities. This trend is also confirmed by the results of the pan-European Urban Atlas Project, which aims to generate comparable data about land use (LU)/land cover (LC) for selected 305 European cities and their hinterlands (Large Urban Zones – LUZ) for the year 2006 (+/–1 year) and 699 LUZ for the year 2012 (+/–1 year) at scale 1:10 000 LUZ Bratislava is also part of such datasets. The aim of the paper is to present outputs of the Urban Atlas Project on the level of LUZ Bratislava for the years 2006 and 2012 and to point to some trends of development in the sphere of LU/LC. Results efficiently show and quantify, for example, the distinct conversion of areas with previous agricultural usage into areas with the different density of urban fabric and different use (industrial, commercial, military or private areas). Results of this project represent an important information source for a spatially verifiable research focused on urban environment and its immediate surroundings.



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# Sustainable Land Use Strategies for Germany – Simulation and Evaluation of Urban Growth Scenarios including Climate Change Mitigation and Adaptation

Johanna FICK, Roland GOETZKE (Germany)

The increase of settlement and infrastructure areas in Germany of about 73 ha/day is still well above the Federal Government's sustainability goal for 2020 of max. 30 ha/day. In addition to achieve higher rates of inner city development to reduce urban sprawl, decision makers in urban and regional planning face new challengers, like adapting settlements to climate change, contributing to the reduction of greenhouse gas emissions and supporting the realization of the energy transition. The research project CC-LandStraD ("Climate Change – Land Use Strategies") analyzes those trade-offs and develops sustainable land use strategies for Germany. The spatial explicit land-use change model Land Use Scanner is used to simulate scenarios of land use change for Germany for the year 2030. The model provides the functionality to integrate different measures of climate change mitigation and adaptation that lead to a change in the rate or the pattern of urban growth. Based on these scenarios a multi-criteria analysis is used to evaluate the effect of the different measures. Therefore a set of indicators has been developed to measure the achievements mitigation and adaptation aims and to uncover trade-offs between these aims. In this contribution the land-use model is presented as well as selected indicators showing the quantitative and qualitative evaluation of measures for (urban) land management. Several measures are combined to strategies of a sustainable and climate-oriented settlement development, which are used for policy recommendations.



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**Historical Land-use/Land-cover Change in Urban Protected Areas: The case of Moscow**

Irina MARGOLINA, Oxana KLIMANOVA, Evgeniy Yu. KOLBOWSKY (Russian Federation)

Against the existing built-up landscapes, protected areas of Moscow seem to be "islands of the untouched nature". But, for a long time, all of them have been developing under the anthropogenic influence evidenced by archeological findings in the Moskva River valley and later archival records. The reconstruction of history of land use-land cover change of study area - The Moskvoretsky Natural and Historical park - was based on historical maps, i.e. plans of the general land surveying (the end of the XVIII century), F. Schubert's map (the middle of the XIX century), first Soviet RKKA maps of the 1930s, and the maps of the General Staff (1960-1980s). Aerial photographs taken by Luftwaffe in 1941 appeared to be an additional and highly informative source. For each historical period, a vector map of land use/land cover was compiled. Data on the modern structure of land use/land cover were obtained through interpretation of satellite images (public Google Maps service) and from the public cadastral map. Localization and changes of the anthropogenic influence indicate the following five main stages of LUCC: 1) extensive agricultural land use – from the end of the XVIII century to the beginning of the XX century; 2) intensive agricultural land use with elements of quarrying – the first quarter of the XX century; 3) hydraulic engineering – the 1930s -1940s; 4) post-war years – beginning of tree planting on the surfaces of flood plain and terraces; 5) the present – mass housing construction on surrounding watersheds, construction of hard-surface roads, and organization of recreation and leisure sites.



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# Use of methodology of soil cover structure for the assessment of resource potential of ecosystems of Belarusian Polesye lowland

Aliaksandr CHERVAN, Andrew CHERNYSH (Belarus)

Belarusian Polesye occupies the southern part of the Belarus with an area of 6.1 million ha. A variety of soil-land resources requires a differentiated approach to recording and evaluating its modern environmentally safe and economically efficient state. Rational use of soil-land resources necessarily implies consideration of all of their distribution and overall assessment. As a result of research the methodological approaches to determining the resource potential of agro-landscapes were developed and their approbation by the example of concrete objects was performed. The possibility of typing soil combinations and characterizing by their unity of properties and features of agricultural landscapes can treat them as types of land. The basis for the selection of some soil combination, in addition to the shape of the structure of soil cover, is the specificity of the four environmental conditions: orographic, geomorphological, lithological and hypsometric ones. As the result, a unified legend for maps of soil cover structure made for the whole territory of Belarus Polesye and combines about 20 types of soil combinations, or types of land distributed differently everywhere. The foundation of the information component of the rational use of soil-land resources is a systematic inventory of the natural conditions of agro-landscapes based on soil cover structure within the boundaries of invariant units – land types. The dependence of the production cost of agricultural production on the value of the resource potential of soil combinations was established and the suggestions for rational use of land erosion and wetland agro-landscapes was developed.



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**Monitoring the changing spatial form of Chengdu City based on satellite image time series**

Yafei WANG, Jie FAN, Dong CHEN, Rui GUO (China)

This study aims to exploit the changing spatial form of Chengdu City in China based on synthetic aperture radar (SAR) image time series. In this area, cloud cover is very high most of the time, which restricts the use of visible and near-infrared satellite data. In contrast, SAR images are less influenced by weather conditions. Here, we present a spatio-temporal change monitoring strategy for the urban sprawl, based on SAR image time series. This strategy mainly includes three components: (1) Construction of pixel-level SAR image time series; (2) Stepwise binary partition mean square error (MSE) model analysis to discriminate changed and unchanged pixels as well as to calculate change nodes, (3) Adaptive fuzzy spatio-temporal clustering to determine the change classes. Experimental results showed: (1) the proposed strategy could effectively extract the change nodes and change pixels to conclude the changing spatial form, (2) Transition sprawl form of Chengdu is from monocentric to multi-nucleated urban form depend on the counties nearby.



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IGU 2015 – 2040

## A Cross-sectoral Approach to Analyse Land Use in Germany

Johanna FICK, Horst GÖMANN, Peter KREINS, Roland GOETZKE (Germany)

Global, national, regional and local driving forces affect land use in Germany. The talk presents modeling results, depicting the impact of global developments on the land use / land use change in Germany. The results are derived regionally differentiated to account for the spatial heterogeneity. We compare the impacts of several scenarios on environment and landscape with a baseline. These scenarios reflect societal demands on land use and land management, e.g. production of food, feedstuff or biomass, demand for settlement and transport areas, contribution to environmental protection and climate change. The scope of investigation is cross-sectoral and considers the major land uses in Germany: agriculture, forestry and settlement/transport. Greenhouse gas emissions due to land use and land use change are one focus, especially direct emissions by land use and land use change and the substitution potential of biogenic raw materials. We analyze these questions with a network of biophysical and socio-economic models. We present indicative results of the models LAND USE SCANNER and RAUMIS. The LAND USE SCANNER is a GIS based simulation model in which qualitatively formulated scenarios are underlaid quantitatively and are simulated in a spatially explicit way. RAUMIS is a regionalised agricultural and environmental information system and simulates the impacts of agricultural and environmental policies on the regional agricultural land use, production, income and the environment. Adjustments are modelled in a comparative static setting. Here, RAUMIS specifies the agricultural land use on county level. Global price projections and information on the available agricultural area (LAND USE SCANNER) serve as inputs. The used multi-level approach integrates global development (e.g. population growth, increase of meat demands), national trends (e.g. demographic change, energy system transformation / energy policy) and regional specifics (e.g. peat bogs or agricultural site quality) in a consistent framework. A multi-level assessment approach allows bundling the scope of effects, including the biophysical and socio-economic dimensions.



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# Ecosystem services, human well-being and sustainable cities – results of comparative German-Russian research work

Diana DUSHKOVA, Dagmar HAASE (Russian Federation)

The paper presents the comparative analysis of the diversity of ecosystem services – key variables for global environmental sustainability and change in an urban era—across a globally important part of the urban world, urban Europe. Although the concept of ecosystem services has been advocated in international scientific community and policy circles in the context of developing countries, the concept lacks a clear empirical foundation for application in an urban context, especially in such globally significant area as the North of Russia. We examine ecosystem services on the basis of data collected in Russian and German cities. Special attention was paid to the development of the concept of ecosystem services in Germany and Russia as well its implementation in the political and economic systems. The results on assessment in urban core areas and their associated hinterlands in relation to human well-being are highlighted and set against the background of each city's land-use development history and planning culture. We used a straightforward calculation method to map different ecosystem services and to assess them in relation to the improvement of the environmental situation and human well-being. The main results show heterogeneous patterns of ecosystem services across the case studies, different potential for urban ecosystem service provisioning and an ecosystem services supply highlighting areas of considerable under supply. Our results provide the first comparative analysis between ecosystem services in urban areas of Germany and Russia and serve to inform decisions on the key aspects of future policy in the cities of both countries.



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# Land Use change impact on biodiversity and local ecosystem. A case study of Thohoyandou, Limpopo Province. South Africa

Olujimi OSIDELE, Nthaduleni NETHENGWE (South Africa)

Over the years, various human activities such as housing, agricultural, commercial and industrial activities, lead to land use/land cover changes in space and time of human habitation on Earth. The study has been carrying out assessment on the impact of land use on biodiversity loss and micro ecosystem of Thohoyandou. One of the methodologies used for analysis was GIS tools application in evaluating the spatial pattern of land use in other to determine to what extent has land use change affect biodiversity and local ecosystem of the study area. Based on this, satellite image of Thohoyandou between 2004 and 2013 was used to conduct comparative analysis of land use change within two period's intervals of five years. Land use identification and classification techniques were also employed to map relevant changes that have occurred within the year interval periods. The findings showed the extent to which residential and commercial activities have impacted biodiversity loss, contributing to ecosystem fragmentation and how this resulted in the present land cover change in the study area. Fragile ecosystem such as wetlands and vegetation cover was recorded up to 45% loss of surrounding trees. Recommendations of the study will provide ways of properly managing forest land use in ensuring no loss of biodiversity amidst expansion activities. The relevance of this study shows how environmental law enforcement, haphazard planning, as well as ineffective zoning principles can be improved to ensure long-term ecological monitoring and land use decision making.



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## Wasteland and Reserved Land around Forest: a crossroad of LUCC in India

Koichi KIMOTO, S. ARUN DAS, R.B. SINGH, R. MAHFUZA, P. SHARMA (Japan)

In India, De-forestation process has long history. In particular, during colonial era British have extinguished the domestic trees. There is no doubt that this process was the cause of the serious de-forestation later. On the other hand, we must not forget that many rules, such as forest law were provided in this period, those rules work in India after independence, it was defined the way of forest management. In 1970's, a Prime Minister India Gandhi accelerated the conservation-oriented process by enacting the laws based on exotic systems. National Park is one of category of Protected Areas (PAs). In the region between the boundaries of newly set PAs and its peripheral appeared by de-forestation, many forest related issues have been seen. In this study, based on field work in Karnataka, Assam and Rajasthan (Regional Governance in Forest and its Fringe (ReGFF) project) , we would like to discuss the followings; 1) to describe process of making the peripheral area, 2) to analysis issues in this area, and 3) to consider the possibility of regional governance.



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## Climate Driven Land Cover Change and Violence in the Sahel

Lindsay ROGERS (United States of America)

There is little doubt that climate change has been taking place across the globe, many scientists have shown the physical effects of climate change, but how will it affect society. The Sahel is one of the regions on earth that has been clearly affected by climate change, and it is also a region plague by violence. The goal of this research is to explore the link between climate change and violence in the Sahel. Even though there have been studies that have shown the Sahel increasing in vegetation in recent years, there also have been reports of small areas in the Sahel that have seen an decrease in vegetation. These areas of decreasing vegetation have put pressure on people forcing some to migrate and creating conflict. Using satellite imagery this research will investigate if various environmental factors might have contributed to the migration and violence seen in parts of the Sahel, especially in northern Nigeria. Specifically the research will use MODIS-based Land Surface Temperature and Vegetation data, Tropical Rainfall Measuring Mission (TRMM) precipitation data along with land-based temperature and precipitation data.



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## Land Use and Land Cover Changes on the Islands of Peter Great Bay (Japan Sea)

Kirill GANZEI (Russian Federation)

On the Peter the Great Bay Islands it is observed essential distinctions of land use. If on Russky Island there is an active involvement of the territory in economic use, within Popov and Reyneke Islands local transformation of landscapes is characteristic. On Rikorda Island there are no settlements, and geosystems are under insignificant anthropogenous pressure, generally as a result of recreational activity here. At the same time Rimsky-Korsakov Islands are a part of SPNR that predetermines functioning of landscapes under natural conditions. In September, 2012 on Russky Island (the Peter Great Bay, Sea of Japan) the Asia-Pacific Economic Cooperation (APEC) summit took place. It passed on the basis of a new campus of Far Eastern Federal University which started building on the island in 2008. Also within preparation for the summit the bridge was built. These actions gave a powerful impulse to development earlier not used territories of Vladivostok. As a result of construction of the bridge and a University campus the land use that led to full transformation on separate sites of environment changed. In 2012 the new development plan of the Vladivostok according to which the considerable part of the island will be used under construction of houses and business centers was accepted. There are no doubts that these actions will lead to even bigger change of environment of the island. Creation of the territory of the priority development with use of mechanisms of public and private partnership has to become a new step on development of Peter Great Bay Islands. Our work is directed on the analysis of land cover changes of Peter Great Bay Islands within preparation for the APEC summit, and an assessment of perspective development of the territory. Application of the principles of landscape planning, development of recommendations to the state organizations will promote to balanced development, taking into account preservation of a natural framework of the island. It is especially actually because of high sensitivity of the isolated island geosystems to anthropogenous influence. The reported study was partially supported by RFBR (project 15-05-01419-a).



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# Integrated assessment of environmental quality of coastal regions of the Pacific Russia for land use planning

Victor ERMOSHIN (Russian Federation)

Pacific Russia - region, adjacent to the seas of the Pacific Ocean within the constituent entities of the Russian Federation. At the same time, there are the coastal territories. These areas need to be considered as contact zones of the ocean-continent system. Methods of selection of coastal land territories of different types on the basis of the GIS analysis are suggested. At the first stage a comprehensive study of the integrated assessment of the conditions of economic activities carried out for those territories within the various natural zones. Serial overlay-analysis of small-scale themed digital maps, reflecting the different natural and man-made conditions carried out using ArcMap 10.2 program. In the analysis were used the following data of three types: natural, natural-economic, socio-economic. Environmental data (maps) have included geographical zoning, average annual air temperature, duration of sunshine, rainfall, the ecological potential of the landscape. Natural-economic data (maps) included the agroclimatic conditions of agricultural activities, anthropogenic pressures on landscapes, use of land, the extremity of climatic conditions for living, air temperature below + 8 degrees C, water availability. Socio-economic data included more than 10 main parameters. A number of features of coastal zones were identified by the geoinformation analysis. At the second stage zoning of the coastal areas as environmental quality and the conditions of economic activities was implemented. A significant differentiation of the coastal areas of these terms was found. It is necessary to conduct more detailed studies in areas with more optimal conditions and high anthropogenic influence. The study was funded by a grant of Russian Geographical Society 01/2013/RGS-RFFR.



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## Geospatial Analysis for Long-Term Changes of Vegetation Fraction in Inner Mongolian Desert Steppe Region, China

Bayaer WULIANGHA. Aodenggaowa, Han WULANQIQIGE, Sun GUANGFU, Chen JIANBO (China)

This study analyzed long-term land cover changes from 1998 to 2013 in Inner Mongolian desert steppe region, China, through extraction of multiyear's 10 day vegetation fraction using SPOT VEGETATION NDVI data (http://proba-v.vgt.vito.be/content/data) from 1998 to 2013 and geospatial analysis for changes of yearly maximum vegetation fraction from 1998 to 2013. Inner Mongolian desert steppe region is distributed in mid-western part of Inner Mongolia Autonomous Region, China and between east longitude 105 degrees 7 minutes to 115 degrees 12 minutes and north latitude 37 degrees 37 minutes to 45 degrees 8 minutes, which belongs to the Eurasian desert steppe and has area of 112000 km2. The SPOT-VEGETATION mission was a collaboration between France, Belgium, Italy, Sweden and the EC. The VEGETATION instruments (VGT1 and VGT2) were incorporated in the SPOT programme, which was founded in 1978. SPOT 4 has been deactivated a couple of years ago. The VEGETATION sensor onboard SPOT 5 stopped its acquisitions on May 31, 2014. In this study, we used spatial information technologies, such as Geographic Information System, Global Navigation Satellite System and Remote Sensing Technology, to get ground truth pictures data approximately 100 random pixels with 1km2 ground size and which are spatially matched with multiyear's SPOT VEGETATION NDVI datasets. Accuracy assessment of extraction of vegetation fraction mainly based on ground truth pictures in 2013 and also used same year's Landsat images for the extraction result of vegetation fraction as a additional reference information. The final results shows that the vegetation fraction had many obvious geospatial changes during the period from 1998 to 2013 in Inner Mongolian desert steppe region.



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## Land Cover Change in West Africa – Changes and Consequences

Fatou B MANDIANG (United States of America)

Human activity and climate change are major drivers changing the land cover of West Africa. Agricultural lands are expanding while at the same time the climate needed for the growth of crops is changing as well. Past changes in West Africa have been negligible due to a low population density and low economic pressures. However, over the past 50 years the region has seen an explosion of population growth and economic activity. In addition to these human changes the region is also experiencing changes in climate, with both of these forces altering the land cover of the region. West Africa is known to have a tropical climate which results in different kinds of land covers from desert (Sahara) to tropical rainforests. In this research, numerous satellite data will be used to map the different land covers of the region and to determine how they have recently been changing. Spatially explicit demographic and economic data will be used to determine human pressures on the land while satellite data (NDVI, temperature and precipitation) will be used to analyze pressures from climate change on the landscape over a time period from 2000 – 2014. In addition to analyzing recent changes, the research will model potential future changes given current trends.



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## Large scale land Acquisition in Ethiopia: Case of Karuturi Global

Mohammad ANWAR (South Africa)

Large scale land grabbing by private firms and states has renewed interests among scholars on conflicts and struggles around land in Africa. This paper further adds another chapter to our analysis of land grabbing in Africa. It looks in particular at the nature and drivers of Indian land investments in Ethiopia. By some estimates 70 percent of foreign investments in agricultural land in Ethiopia are by Indian companies. Through the case study of one of the Indian firms' (Karuturi Global) land investments in Ethiopia, this article seeks to understand the dynamics and political-economic drivers behind the contemporary land grabs in Africa by India and what it means for the local economic development. The paper, therefore, argues that the principles used for the land take overs during the colonial times are still relevant under the guise of neoliberal globalisation in Africa. The central argument of the article is that new emerging players, such as India, in the African political economy are becoming another piece of the colonial and neo-colonial re-mapping of the African continent through hegemonic capitalistic adventures. If the colonial land take overs were forceful, brutal and violent without the consent of the African population, the neo-colonial land grabs in Africa are often done through the willing participation of the African statesmen which sometimes leads to violent conflicts. It concludes with the implications of these large scale land grabs over the local population in Ethiopia's Gambella region.



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# Assessment of Soil Organic Carbon Stock under Different Land Use in the Sub-humid Eco-region of India

Poushali ROY, S. SREEKESH (India)

Soil organic carbon (SOC) content is one of the most important indices of soil quality. SOC accumulation or loss in the ground, leading to carbon (C) sequestration or emission respectively, is intense in the plough layer of soil profile (0–20 cm), and depends on land use and land management practice. In the present scenario of global warming, one of the measures of reducing atmospheric C is by sequestering the excess C in soils. This, however, requires a prior estimation of C stock in soils at global, regional and local levels. The objective of the present study is, therefore, to estimate SOC stock in the plough layer under different land use in the sub-tropical sub-humid, red soil region of India. Soil samples have been collected from 0-10 cm and 10-20 cm depths during the non-growing phase from plots under different land use in the Irga watershed in the Giridih district of Jharkhand state in India. Four broad land use classes have been identified as representative of the study area: (1) native deciduous vegetation; (2) Eucalyptus plantation; (3) cultivated land and (4) culturable waste. SOC using Walkley-Black method and soil bulk density under different land use has been estimated. SOC stock per unit area was calculated and was found to be higher in the cultivated areas than in the areas under native deciduous vegetation. It was, however, the highest was in the mango garden. SOC stock decreased with depth under all land use types.



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## Hydrocarbon status of soils in landscapes

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Hydrocarbon status of soil (HSS) is its specific property, expressed in certain set of hydrocarbon compounds – hydrocarbon gases in soil air; the total content and qualitative composition of bitumoid, composition and concentration of individual hydrocarbon compounds (polycyclic aromatic hydrocarbons, etc.). The knowledge of HSS has high informative potential in terms of analysis of functioning the soil system and also landscape at large, as soils act as a focus of various landscape processes and phenomena. Study of HSS acquires the practical applicability in the context of the global processes of oil extraction, transport and usage of hydrocarbons. The specific HSS's were studied within number of sites. On the site «Noginskii» (Moscow region) the areas of technogenic fallout from the atmosphere on the soil surface near the industrial plants were identified, the different types of the HSS were observed. On the site «Privolzhskii» (Volgograd Region) the high hydrocarbon concentrations, influencing HSS, were detected within the soil profiles, it was caused by the oil and oil products leakages of different time from the exploitation wells and pipelines. The site «Ustianskii» (Arkhangelsk Region) characterizes the area where HSS is the result of spontaneous free circulation of hydrocarbon-rich gases in soil profiles. On the site «Syzranskii» (Samara Region) the HSS was modified because of hydrocarbon migration from the underlying rocks, represented by oil shales. The HSS features of «Istrinskii» plot (Moscow region) can be caused by natural degassing the depths in the area of contemporary tectonic activity. This research was funded by Russian Scientific Foundation (Project 14-17-00193).



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## Forest change in the centre of Eastern European plane (the 19th-20th century)

Maria ARKHIPOVA (Russian Federation)

We've mapped the change of forest distribution in the centre of Eastern European plane (Central Russian Upland (CRU) and Oka-Don plain) from the end of the 19th century till the end of the 20th century. Also we estimated the field overgrowing by wood vegetation during the last 20 years. The forest cover increased at the northwest slope of CRU, in Meshchera region, at the right bank of the Tcna river and along river Don and it's inflows during the last 120 years. The decreasing of forests took place at the south and east of CRU. Fields overgrow by wood vegetation within the broadleaf deciduous forest zone, except the northeast of CRU. In the forest-steppe and steppe zones this process does not occur. During the last 130 year forest difference between north and south parts of the study region increased (table 1). Table 1. Change of forest percentage from 19th century till 20th century. Zone Forest percentage 19th Forest percentage 20th deciduous-coniferous forests 40% 60% deciduous forests 22% 24% forest-steppe 9% 7% steppe 5% 5% We detected regional special aspects of forest distribution caused by human impact. The forest planting after World War II increased forest percentage in river valleys within the steppe zone. The increase of forest percentage at the south of study region due to protection of abatis forest took place. Also we studied the rate of field overgrowing using the key areas. The fields overgrow by wood vegetation for 20% at the north slope of CRU, for 16% at the north part of CRU, for 11% in the centre of CRU and for 6% at the south of CRU during 10 years.



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## Agricultural lands use dynamics in the Volga river delta from multitemporal remote sensing data

Elena BALDINA, Ksenia TROSHKO (Russian Federation)

Agricultural lands use in the Volga river delta has undergone significant changes during the last several decades. During the Soviet period this region was called «all-union garden» due to extensive growing of water-melons and vegetables. Irrigated agriculture started in 1950-s, and by the middle of 1960-s most of the territory was protected against spring tide by dams and moats, and cultivated fields were watered by pumps. The Caspian sea level rise started from 1978 and subsequent rise of groundwater table induced soil salinization. Therefore, these natural factors led to agricultural fields' abandonment at the lower part of the delta. The next stage of changes was caused by economic reforms of 1990-s and termination of subsidies to agriculture, that resulted in the abandonment of the most previously irrigated fields. Unused agricultural lands, which are protected from spring tide, degrade in various ways (shrub overgrowth, desertification and soil salinization). The degradation degree depends on abandonment period and location. Archive of Landsat space images including data from 1975 to present provides an opportunity to map and study these changes over the whole region of Volga river delta using unified data sets and methods. LULC patterns were revealed by selecting and analysis of at least 3 cloudless images covering the whole growing season for each representative year. LULC changes detection was based on multi-year images analysis. The result of images analysis is presented as a series of maps showing land use patterns for different years. We suppose to evaluate the degradation degree of abandoned agricultural lands basing also upon remote sensing data acquired by different sensors, including SAR, and ground truth data obtained in summer 2014.



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## Application of change detection techniques for land use analysis of Zapolyarnoye gas field

Paul KARGASHIN, Maria KARGASHINA (Russian Federation)

Geography researches are often based on remote sensing data. Interpretation of images gives spatial location and properties of objects. Nowadays some techniques of image processing are used to detect changes of natural and anthropogenic objects. There are image differencing, band composition, image classification among these methods. This work is aimed to indicate, that application of change detection techniques is wider than it is traditionally shown. The research was performed for Zapolyarnoye gas field, which is located in forest-tundra natural zone. The series of Landsat images covers the period from 1990 to 2014 year. Space images were used to determine spatial location of gas facilities, pipelines, roads, quarries within gas field. Classification of single bands or coloured images hadn't got sufficient results due to natural features of the territory. Some natural objects have the same colour as facilities have. It was offered to solve the problem via change detection methods. The first image of the series represent the territory before exploitation and the other show different stages of exploitation. Each image was compared with the first one in series. The result of operation figured out changes and there were outlined contours of anthropogenic objects among them. It became possible to outline multiply well plots, gas processing stations, quarries, pipelines, roads, settlements. The results of the investigation are maps of gas field infrastructure and land disturbance based on images interpretation via change detection methods. There were designed maps for different stages of industrial development.



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## Land Cover Change in Northeastern North America from 2000 to 2014

Stephen YOUNG (United States of America)

Land cover is changing throughout the world, being driven by human activity and a changing climate. This research uses multiple satellite data sets to understand how the land cover of Northeastern North America is changing. Data from MODIS, AVHRR, ASTER, SPOT Vegetation and Landsat will be used to characterize the land cover of this region and analyze how it has changed between 2000 and 2014. The dominant vegetation types in this region vary from broadleaf deciduous to boreal evergreen to tundra with a variety of transitional ecosystems. The research will show how these biomes are changing and what repercussions this change has for the natural environment and for humans who live in the region. Based on MODIS Land Surface Temperature, most of the region is warming, especially at night, and based on SPOT Vegetation and MODIS NDVI the region is increasing in photosynthesis, especially in the tundra areas. The research will also explore the driving forces of change in this region from forestry activity to a changing climate. This research concludes by modeling future changes and discussing the possible consequences of these changes.



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## Land Use and Land Cover Change in Northern Thailand (Nan province) during 1995-2012

Baicha WONGTUI (Thailand)

In this paper, the author analyzed dynamics of land use and land cover change in Nan province (Thailand) from 1995 to 2012. The study area covers 1,205,412 ha. Satellite data Landsat 7 ETM from 2002 and 2009, THEOS/THAICHOTE from 2012 and vector data set years 1995 and 2000 issued by Land Development Department (Thailand) were employed. Data preparation was conducted by using remote sensing technics. Analysis and mapping was done by using geographical information systems (GIS). The result showed that the main types of land use and land cover were natural forest, perennial crop, swidden cultivation, field crop, pasture, forestry plantation and paddy field respectively. The change of land use types during almost 20 year period were characterized by rapid decreasing of natural forest areas and increasing of cultivated areas. From 1995 to 2012, natural forest areas decreased from 856,246 ha to 500,439 ha or 41.6%, whereas cultivated areas increased from 342,997 ha to 518,257 ha or 51.1%. Land use changes in the study area are much influenced by economic factors, such as increased need for cash and easier access to markets for agricultural products. It also caused by the government policy through the promotion of cash-crop cultivation and permanent fields.



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## Anthropogenic transformation of sub-Mediterranean landscapes of Russia

Marina PETRUSHINA, Ksenia MEREKALOVA (Russian Federation)

The investigation has been done to reveal the spatial organization, transformation and current ecological state of the sub-Mediterranean landscapes of Russia which exist in the northeast area of Mediterranean landscapes of Europe and are characterized by relict and endemic species of biota and fauna. The high concentration of different types of land use in a rather narrow coastal zone of the Black sea is typical for the region. The ecological situation is aggravated nowadays due to the recreation increase and construction of new pine-lines and oil terminals as well as periodic influence of active nature processes such as high-floods, debris flows, hurricanes, landslides. Three key regions were chosen for the study – the Abrau Peninsula (between Anapa and Novorossiysk) with nature reserve "Utrish", Tuapse region and the south part of the Crimea Peninsula. Several periods with different types of land use and consequences to environments have been revealed to these regions. Large-scale (1:25000) landscape maps and maps of landscape transformation have been compiled on the basis of field study and remote sensing data analysis. Natural and anthropogenic modified geosystems with different types of transformation under the anthropogenic impact have been shown on the maps. The degree of transformation of vertical and spatial structure of the landscapes has been chosen as the main criteria of the landscape changes. The integral schemes of landscape planning with recommendations based on the maps of landscape suitableness for different types of land use have been also compiled and "conflict zones" in the land use have been determined for some model areas.



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## Analysis of the expansion of the olive grove in the province of Jaén through cartographic sources

Pilar García MARTÍNEZ (Spain), A. Paniza CABRERA, J.D. Sánchez MARTÍNEZ

The province of Jaen is the most radical example of olive specialization of the world, destining to the olive groves more than 91 % of its agricultural surface. Through cartographic sources of expansion took place from middle of the 20th century is reconstructed, stressing in the spatial keys of a process in which there has predominated the strategy of substitution of other agricultural uses before that the expansion of the agricultural frontier. Likewise, there are identified some of the current characteristics of this extreme monoculture, between them those who allow us to understand its high global productivity (increase of the irrigated surface, take up of soils of better agronomic conditions) or the coexistence of olive groves of very different landscape and economic potential.



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## Comparison of simulation models in terms of quantity and allocation of land change

María Teresa CAMACHO OLMEDO (Spain), Robert Gilmore PONTIUS Jr. (US), Martin PAEGELOW (France), Jean-François MAS (MEXICO)

Land Change Models can be useful tools for environmental and geomatics research concerning land use and cover change (LUCC). The simulation maps obtained from LUCC models help us to understand, forecast and anticipate the future evolution for a variety of applied environmental problems. One of the most important challenges is to clarify the validity of the outputs from the models. Our study concerns how to compare the outputs from models that simulate transitions among categories over time. We illustrate the concepts by comparing two models in Idrisi software (Clark Labs): Land Change Modeler (LCM) and Cellular Automata Markov (CA_MARKOV). Our goals are to show: (1) how the modelling options influence the quantity and allocation of simulated changes, and (2) how to compare output maps from pairs of model runs with respect to a reference map of change during the validation interval. We recommend that the first step to validate the output of a land change model is to assess the quantity of each transition, meaning the sizes of areas of the temporal changes. Users must understand the reference transitions during the calibration and validation intervals. Then users must understand how the method for extrapolation of the quantity of each transition works. Our recommended second step to validate the outputs among land change models is to assess the variation in the allocation of changes and determine the cause of the variation. The assessment of quantity and allocation of change is a helpful framework to learn how models work, and to communicate pattern validation.



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# C12.28 Local and Regional Development

## Local and regional development in Russia 1

**Chairperson(s):** *Tatyana BOCHKAREVA*

- Agriculture of Altai Krai under climate change: looking for ways of intensification

  *Bella KRASNOYAROVA, Yuri VINOKUROV, Sergei GANZA (Russian Federation)*

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- New Moscow Tomorrow: Cutting-Edge Mega-Region or Sprawl?

  *Robert ARGENBRIGHT (United States of America)*

- Model studies of the problem of "sustainable development of regions"

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- Economic disengagement in Russia

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- Revolution of proximity: a new chance for the Russian economic geography?

  *Alexander PELYASOV, Nadezhda ZAMYATINA (Russian Federation)*

- Genesis and system of scientific relations in the local scientific communities of human geographers in Russia

  *Kira MORACHEVSKAIA, Dmitry ZEMLYANSKIY, Vladimir SHUVALOV (Russian Federation)*

- Russia's Spatial Organization Before Tectonic Shift

  *Viacheslav SHUPER (Russian Federation)*



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**Chairperson(s):** *Bella KRASNOYAROVA*

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  *Stepan ZEMTSOV, Alexandra BOZHECHKOVA, Alla SOROKINA (Russian Federation)*

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- The rural labour market in Central Russia: commuters and idlers

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- The request for sustainable regional development: Rural Society coping with innovations. A case study in the Altay Region

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  *Olga SHUVALOVA, Mikhail PANTCHICHKINE (Russian Federation)*

- Patterns Of Rural Development In The Coastal Districts Of Maharashtra State

  Dhanashree SURESH SHINDE (India)



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- Township and Village Enterprises and their Role in Modernization of China's Economy

  *Ksenia MIRONENKO (Russian Federation)*

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- Changes in land uses in Arab settlements in Israel: Urbanisation versus the shrinkage of agricultural areas

  *Michael SOFER, Noaman GNAIM, Jallal GNAIM (Israel)*

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  *Jie GUO (Germany)*

- Post-Communist Urban Sprawl Related Built-Up Areas Dynamics In The Bucharest Metropolitan Area

  *Ines Manuela GRIGORESCU, Gheorghe KUCSICSA, Bianca MITRICĂ, Irena MOCANU (Romania)*

- The Jobs-housing Relationship and Commuting in Guangzhou, China: Hukou System and the Persisting Dual Structure

  *Liu YI, Li SIMING (China)*

- Geography of Slums: The Unresolved Paradigm of Slum Improvement Initiatives in India

  *Kanika BASU, Sumana BANDYOPADHYAY (India)*

- Overseas operations of local firms and cross-border management: A case study of Japanese local firms

  *Atsushi TAIRA (Japan)*

**Local and regional development: project and planning 1**

**Chairperson(s):** *Yafei WANG*

- Determining social dimension of vulnerability in Romania by exploratory spatial data analysis

  *Ibolya TOROK (Romania)*



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- Territorial Disarray And Competition Between High-Speed Railway Stations Outside Medium-Sized Cities And Conventional Railway Stations: A Failed Attempt To Co-Ordinating Urban Development And Railway Stations As A Component Of Urban Sustainability

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  *Oleg SINYUGIN, Mikhail BEREZKIN (Russian Federation)*

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  *Alla PAKINA (Russian Federation)*

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  *Chen HONGSHENG, Wang XINGPING (China)*

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  *Guo RUI, Fan JIE, Chen DONG, Wang YAFEI (*China*)*

- From Strategic Coupling to Decoupling and Recoupling: Changing Dynamics of Global Production Networks and Evolution of Regional Development in China

  *Chun YANG, Fan JIE, Chen DONG, Guo RUI (*China*)*

- Development of Backward Regions in India: Issues and Concern

  *Krishna MOHAN (*India*)*

- Origin Effects, Spatial Dynamics and Redistribution of FDI in Guangdong, China

  *Hua Xu, Anthony YEH (*China*)*

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  *Yafei WANG (China)*

- *Gold Mining and Sustainable Development in Saudi Arabia*

  *Mohammed ALDAGHEIRI (Saudi Arabia)*

- Local and regional development in the Great Eastern Venezuela : an example of "pioneer" local and regional development

  *Anne PENE-ANNETTE (France)*



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# POSTER EXHIBITION

- Special aspects of territorial and productive combinations in modern Russia

  *Andrey LUCHNIKOV , T.A. BALINA, N.D. EROPKINA, M.B. IVANOVA, B.A. KAZAKOV, A.M. KOROBEYNIKOV, A.A. LYADOVA, S.A. MERKUSHEV, R.S. NIKOLAEV, V.V. REZVYKH, V.A. STOLBOV, T.V. SUBBOTINA, L.Yu. CHEKMENEVA, L.B. CHUPINA, P.S. SHIRINKIN (Russian Federation)*

- Municipal Reform of Rural Settlements in Old Developed Regions of Russia: Problems of Territorial Organization

  *Zinaida PONOMARYOVA (Russian Federation)*

- Medium-sized cities in the system of settlement of Central Russia

  *Ilya SMIRNOV, Alexandra FOMKINA (Russian Federation)*

- Economic-geographical aspect of the quality of life population of Penza region

  *Natalya SIMAKOVA (Russian Federation)*

- Interaction of Transformation of Territorial Structure of the Russian Higher School and Regional Development

  *Alexander KATROVSKY (Russian Federation)*

- Effective use of natural capital as the factor of sustainable development in subsidized regions (Evidence from Kirovskaya Oblast)

  *G.D. MUKHIN (Russian Federation)*

- Recreation and tourism in the actual restructuring of Crimea coast nature management

  *Olga BLINOVA, Tatyana KOROL (Russian Federation)*

- The Identifying And Mapping Of Environmental Management Restrictions For The Bolshezemelskaya Tundra Cryolithozone

  *T.Yu.ZENGINA, G.G.OSADTCHAYA (Russian Federation)*

- Regional and local geographical potential of renewable energy sources in Russia

  *Alexander A.SOLOVYEV, Kirill S.DEGTYAREV, Alim M. ZALIKHANOV, Konstantin V. CHEKAREV (Russian Federation)*

- Fires in the technosphere as regional development risks: the spatial and temporal dynamics

  *V. VASHCHALOVAT (Russian Federation)*



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- Special aspects of territorial and productive combinations in modern Russia

  *Mikhael SHARYGIN, T.A. BALINA, N.D. EROPKINA, M.B. IVANOVA, B.A., KAZAKOV A.M. KOROBEYNIKOV, A.S. LUCHNIKOV, A.A. LYADOVA, S.A. MERKUSHEV, R.S., NIKOLAEV V.V. REZVYKH, V.A. STOLBOV, T.V. SUBBOTINA, L.Yu. CHEKMENEVA, L.B. CHUPINA, P.S. SHIRINKIN (Russian Federation)*

- Reproduced Natural Resources in the Regional Development of modern Russia

  *Irina VOLKOVA (Russian Federation)*

- Geoecological problems of the regions in Russia

  *Ekaterina BULDAKOVA, V.G. ZAIKANOV, T.B. MINAKOVA, I.N. ZAIKANOVA, I.S. SAVISKO, U.P. TOLSTAYA(Russian Federation)*

- Conditions of Development, Current Situation, and Quality Management in the Cities and Districts (Concept and Methods of Evaluation)

  *Alexander TKACHENKO, L.P. BOGDANOVA, A.S.SHYUKINA (Russian Federation)*

- Maritime Openness and Its Future Prospects in Iraq

  *Mohanad HAMMAD, Ramond WOESSNER (France)*

- Cluster and its spatial measurement

  *Vladimir ILIN (Ukraine), N.E. NEFEDOVA, I. I. MECHNIKOV (Russian Federation)*



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## Agriculture of Altai Krai under climate change: looking for ways of intensification

*Bella KRASNOYAROVA, Yuri VINOKUROV, Sergei GANZA (Russian Federation)*

Global climate changes are very specific and highly differentiated in the regional climate conditions. The analysis of contemporary trends in heat and moisture support in Altai Krai implies the prevalence of aridization processes: temperature increase and a slight growth of precipitation, which is insufficient for optimum moisture support. Altai Krai refers to agriculture-oriented regions of Siberia, providing food security in a number of food products. It is in the top 10 regions of Russia in the production of grain, flax-fibre, cattle and poultry, milk and honey. It produces 2.8% of agricultural products of Russia. The region's economy is largely determined by agriculture development. The change in agro-climatic conditions may have far-reaching implications for socio-economic development and the livelihood of the rural population. The enhancement of natural risks, unstable agricultural development and high risk of natural disasters and emergencies due to spring and autumn frosts, droughts, and showers are expected. The climate change will lead to changes in economic management; therefore, looking for the ways of intensification of crop and animal production, the introduction of new technologies, and the monitoring of natural and climatic processes is of current concern. One of the main constraints of agriculture development is the lack of financial assets and poor development of financial institutions providing land and mortgage lending widely used in the world practice. They ensure credit resources for agricultural commodity producers and allow the banks to form the market of agricultural lands and control their management.



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**Algorithm of estimation of territories potential for using renewable energy systems (territory of Big Feodosia as an example)**

*Tatiana GORBUNOVA (Russian Federation)*

Crimea is poorly provided with its own traditional energy sources: 93% of electricity, 52-55% natural gas and 96% liquid fuels come from outside. Crimean region has a sufficiently large quantity of renewable energy: solar, wind, geothermal, biomass energy. Developed and adopted in recent years programs and development projects of the Crimean region are aimed at ensuring its sustainable development in the future. According to the Federal Target Program "Social and Economic Development of the Republic of Crimea and Sevastopol until 2020", one of the main objectives for optimal development of the region is the creation of his own generation and the ensuring reliable and uninterrupted power supply of consumers of the Crimean peninsula. Within the framework of the Program implementation of energy and resource saving and environmentally friendly technologies must be ensured. Realization of this task is closely connected with the necessity of conduct research of regional potential on possibilities of placement of renewable energy object that can be realized using modern geoinformation technologies that already contain a number of software solutions that allow calculating theoretical potential of the territory. The result of the given study was the developed algorithm of estimation of theoretical and technical potential of territories of regional and macro local level for using solar and wind energy systems by using software ESRI Arc GIS 10.1 in conditions of mountain areas and low ensuring of meteorological data. Testing of the algorithm was made on an example of Big Feodosia.



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## Monotowns vs diversification: opportunities for choosing development strategies for small settlements on the example of towns and villages situated in the north of the Sverdlovsk region

*Daria ELMANOVA, Alexey FADDEEV, Andrey ENTIN, Alina KHUSAINOVA, Anastasia SHURYGINA, Boris NIKITIN, Ivan SHAMALO, Vladimir MATSUR, Anatoly BELYAEV, Razil SUNGATULLIN (Russian Federation)*

After the collapse of the Soviet Union many Russian cities were faced with the problem of selecting the further development strategy. Due to the nature of the planned economy, production sites and, as a consequence, settlements, often emerged in the places that were not always justified in terms of profitability in accordance with the market economy. The change of regime in the 1990s, global crisis in 1998 and 2008 as well as general structural crisis in Russia — all that have acutely identified the problems of monotowns. Despite the active state policy to support monotowns, without the initiative coming from below (including the authorities as well as entrepreneurs) it is almost impossible to do anything about it. Cities and towns situated in the north of the Sverdlovsk region form a single industrial area and are at different stages of industrial production transformation as well as the transformation of the economy in whole. According to the level of single-industry domination there are three types of cities: cities that have preserved their monospecialisation — Volchansk, Krasnoturinsk, Severouralsk and Serov; city which is now at a transitional stage and in the future is likely to cease to be a monotown — New Lala; cities with diversified economy — Ivdel and Karpinsk. On the basis of the role of the main enterprise and the interaction with the outside world there are the following types of settlements: those which managed to keep their "town-forming" enterprise; towns where the main company is functioning but has significantly reduced its production and lost "town-forming" role; towns which due to their location have become "sleeping areas" of the city; and dying towns that no longer possess necessary environment for their future development.



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## New Moscow Tomorrow: Cutting-Edge Mega-Region or Sprawl?

*Robert ARGENBRIGHT (United States of America)*

For centuries Moscow elaborated a spatial structure characterized by radii emanating from the center linked by a succession of circle routes. In the post-Soviet period avtomobilizatsiia has made Moscow one of the most congested cities in the world. In 2011 former President Medvedev created "New Moscow" by annexing a swath territory stretching to Kaluga Oblast'. Leading global design firms made plans for "New Moscow," but Moscow's government retains control over the territory's development. Planners and officials see New Moscow as part of a broader "spatial fix:" the effort to transform the monocentric capital into a polycentric mega-region such as those found in Europe, N. America, and E. Asia. Top priority is to reduce congestion in Old Moscow, making it more livable. Also, the multi-nodal form of the mega-region is thought to be better suited for involvement in the global economy. But several factors endanger the realization of City Hall's plan. City officials expect the new territory to be populated by 1.5-1.8 million Muscovites, without considering that New Moscow's development may act as a magnet for migrants from other regions. Despite plans to extend public transportation, development of the new territory, which is 1.5 times as large as Moscow proper, is going to increase automobile-dependence and, consequently, air pollution. Finally, if economic recession does not derail the project and New Moscow takes shape as currently imagined, it will boost Moscow's supremacy over the rest of the country to an unprecedented degree.



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## Model studies of the problem of "sustainable development of regions"

*Vladimir SVETLOSANOV, V.N. KUDIN (Russian Federation)*

Sustainable development is the dynamics, the process. To understand how stable will develop a natural system, it is necessary to create a model of the natural system. Study of the problem sustainable development at the regional level was associated with the Kirov - Apatity district of Murmansk region. The integral aggregated indicator for the assessment of sustainable development in the region was needed to find. The expert assessment, using method Delphi, was used. Profile was created from 3 parts. As a result of questioning the experts concluded that the decrease in population by 20% and more connected with unsustainable development in the region. This conclusion was taken as the basis for the evaluation of sustainable development of the region. If the region is growing steadily, then, first of all, gradually increasing the number of people reaching their limit values for the region. The statistical data were analyzed and bank of statistics development of the Kirov – Apatity was created. Based on this additional statistical material the curve describing the time variation of the Kirov – Apatity of population was modeled. A strong decrease of population in recent years has required the introduction of additional model hypotheses to explain the course of the curve. It was recorded and integrated the equation for population change Kirov - Apatity. The results are shown in the graphs that have been analyzed in terms of "sustainable development of the region."



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## Spatial dynamics of the manufacturing industries' transformation across regions of Russia in the 2000-2010s

*Igor PILIPENKO (Russian Federation)*

Having lost ca. 6 million jobs in 1991-1998 and some key science-intensive industries such as manufacture of machinery, the industrial sector in Russia, and especially low-tech manufacturing, was among the biggest winners from the 1998 financial crisis due to the national currency devaluation. Along with the mining sector, low and later medium-tech manufacturing became one of the driving forces behind the Russia's economic revival during 1999-2007. However, the structural adjustment to the market economy over this period resulted in a loss of additional more than 1.2 million manufacturing jobs. Contrary to 1998, the 2008-2009 economic crisis hit the manufacturing sector hard triggering a 15% contraction and new massive job cuts exceeding 800 thousand only in 2009. Despite some positive effects from this crisis, which pushed companies for further optimisation, the lack of high-tech manufacturing and a huge decline in manufacturing employment posed recently a question about the need for a new industrialisation as a pre-requisite for modernisation of the Russian economy. This paper seeks to explore and map spatial patterns of the Russian manufacturing industries' transformation at regional and local levels over a 15-year period. We reveal trends in specialisation, (de)concentration, and productivity of manufacturing activities at different aggregation levels of the Russian Classification of Economic Activities (OKVED) as well as determinants of these trends employing geographical and economic analysis techniques.



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## Economic disengagement in Russia

*Zuzanna BRUNARSKA (Poland)*

The study offers a quantitative analysis of factors influencing economic disengagement in Russia. It refers to the concept of 'disengagement from the state' and the notions of 'syndrome of withdrawal' and 'economic autonomy from the state'. Economic disengagement which reflects in that households take over financing of some services or generate income in the non-public sector is measured by means of a composite index constructed out of several components comprising the phenomenon (such as private sector employment, subsistence farming, resorting to private education and health care, labour migration or private house ownership). The study offers both a regional and an individual-level perspective. The former, based on aggregated data published by Rosstat, depicts the regional diversity of intensity of economic disengagement in Russia and investigates the dependence between the intensity of disengagement and certain regional features. The latter, based on RLMS-HSE data, accounts also for individual characteristics. The results of a linear regression analysis based on aggregated data demonstrate that, all else held constant, economic disengagement is positively associated with the region's GRP per capita, but negatively with average wages. Multilevel ordered logistic regression run on RLMS-HSE data indicates a positive association for individual income. Furthermore, the multilevel analysis shows that representatives of Russian and titular ethnic groups are less likely than representatives of other ethnic groups to be economically disengaged. Moreover, the size of settlement proves to be a significant predictor of economic disengagement. The smaller the settlement, the more likely to be economically disengaged are its residents.



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**Revolution of proximity: a new chance for the Russian economic geography?**

*Alexander PELYASOV, Nadezhda ZAMYATINA (Russian Federation)*

Geography always deals with the interaction of different agents within the place with the formation of local geosystems and complexes. This interaction goes through different ways: climatic, geochemical, biosystem and socio-economic. The theory of proximity is a very powerful tool for the study of such interactions. A common feature of all modern phenomena in the sphere of location of productive forces (clusters, industrial districts, urban agglomerations and others) is that: all of them in a completely unprecedented degree are actualizing the proximity effects, both spatial and institutional (organizational, social, cognitive). This may seem a paradox, but never before the geographical and non-geographical proximity has been so fundamentally important and never did it play such a crucial role in regional economic development, regional policy, in learning processes - as in the modern era of globalization, information technologies and telecommunications. Both for the Russian and the international school of economic geography, this is good news. This interdisciplinary approach gives the right of intellectual leadership to our science within the multidisciplinary umbrella of social sciences. Profound understanding of contemporary socio-economic processes in the Russian space is impossible without attracting apparatus of the theory of proximity developed by André Torre, Ron Boschma and others. The first work performed in Russia in this methodology confirmed this finding (Suvorova A. C., 2014). The summary of works of foreign authors and the first studies on the Russian material allows us to offer seven priority directions for further development of the approach in the theory of proximity. 1) Economic-geographical research of the "space of flows" (directions of migration, investment, international trade, information flows): institutional forms of proximity are the key factor determining the geographic division of labor, the configuration of networks "supplier – consumer", "subcontractor – base manufacturer", the location decisions of foreign investors etc.; 2) Theoretical studies of spatial territorial structures: the concept of proximity allows us to radically expand the field of study going to the multidimensional analysis of a series of anamorphic spaces; 3) Cultural and social geography: the concept of proximity allows us to start studying the relationship between cultures and cultural landscapes, to explain the phenomenon of multiple territorial identity etc.; 4) Regional policy: here the concept of proximity gives us a new approach to the fundamental dilemma of choice between supporting people or supporting places, allows us to find new mechanisms to ensure social justice and economic efficiency, in favor of place-based policy; 5) The regularities and peculiarities of formation



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of local socio-economic complexes of different nature (clusters, agglomerations, regional innovation systems): spatial and institutional proximity plays here a crucial role in the formation of effective economic interactions and complexification; 6) The development of peripheral and poorly equipped Russian spaces, especially in the Arctic zone of the Russian Federation: the concept of temporal proximity allows us to develop new (and explain existing) mechanisms of compensation in the conditions of periphery such as sparse infrastructure facilities, the lack of regular economic contacts, sparse population density, etc. 7) Innovative regional and local development, factors of learning and assimilation of innovations: a variety of forms and configurations of proximity determine the paths of innovation diffusion, and the existing lock-in on the path of knowledge spillovers. The potential of each direction of the economic-geographical study of proximity will be demonstrated on the specific examples from the research and field experience of the authors in the last 20 years.



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# Genesis and system of scientific relations in the local scientific communities of human geographers in Russia

*Kira MORACHEVSKAIA, Dmitry ZEMLYANSKIY, Vladimir SHUVALOV (Russian Federation)*

It is a common knowledge that universities are the core participants of the scientific process. The purpose of our research was to identify the factors of formation and the nature of scientific relations in the local communities of human geographers at the universities of Russia. In 2013-2014 the sample surveys of the human geographers was conducted at universities of Moscow, St. Petersburg, Perm, Voronezh, Kursk, and Barnaul. Our data showed that there are four genetic types of research communities of human geographers: 1) institutional (common place of employment), 2) leadership (one or more scientific leaders), 3) "geographical" (common place of residence), 4) thematic and methodological (common scientific themes and/or research methodology). We proved that geographical factor played a significant role in the formation of any local community but only in Moscow and St. Petersburg it was determinative. In these cities the research groups are rather big, and the intensity of the internal relations is too low to form a unified local community. The genesis of scientific communities in other regions is predominantly leadership. We determined the three-level hierarchy for such communities: 1) scientific leaders ("great"); 2) followers of the "great", leading the most active scientific work; 3) young members of the community, leading researches under the supervision of the "great". Local communities in the regions are closed; their members have little or no intensive scientific contacts outside their place of residence. This appears in only type of co-authorship – "teacher-student" – and quoting – only members of the local community. In leadership communities hierarchical system of scientific contacts is predominant, and this reduces their scientific potential.



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## Russia's Spatial Organization Before Tectonic Shift

*Viacheslav SHUPER (Russian Federation)*

The transition from Pax Americana to Pax Sinensis as a long-lasting tendency and the sharp degradation of the relations between the Russia and the West, for a long also are fraught with serious consequences for the Russia because its Pacific front is terribly poor. The Russia is quickly constructing now the oil and gas pipelines in order to re-direct its fuel supplies to the China above all, but to the another countries also. The Russia has the ambition to occupy 15% of the world liquefied gas market towards to 2030. Big Russian geographer Isaac Maergoiz put forward in early seventies the conception of accelerated development of the Soviet Far East based on its very favorable (even at time!) geographical position. The highly developed Far East should become the second base of the Siberia colonization. The time was lost and the Russia shell proceed now to the accelerated development of its Far East with the reduced demographic and economic resources. The forming of the urban system of the Russian Far East is absolutely necessary. Such a system is absent now in the Far East Federal District having 36% of the national territory, but only 4% of the population. Vladivostok is big of 603 000 inhabitants now, but it can have twice more if taken with its agglomeration. It's quick development can make it in 10-15 years Pacific St. Petersburg, third city of Russia, capital of the Russian Far East, head of the central place system with K=2.



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## Types of regional economic development in Russia

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The economic growth in large developing countries (China, India, Brazil, Mexico, etc.) is accompanied by a sharp increase in regional differentiation. Regions-exporters, as well as regions with an advantageous geographical position (border and coastal regions) have higher rates of growth, and they eventually achieve higher levels of development. In Russia, the 2000s was a period of rapid economic growth, based on export of raw materials, food and weapons. The growth increased regional disparities. The purpose of the paper was to identify the main factors of economic development of the Russian regions and classify the regions, according to the main factors. The authors constructed a panel regression on regional data during 1998-2012 for different periods and groups of regions. The dependent variable was growth of real gross regional product (GRP) per capita. For the whole sample, positively significant factors were GRP share of the mining industry and an advantageous geographical position (coastal regions and close to the agglomerations). Controversial factors were the influence of international trade (import per GRP), foreign direct investment and technology transfer (the share of machinery and equipment in import). Human capital (years of schooling) and investments in R & D were significant for regions with a predominance of the manufacturing industry. Budget investment per capita is a significant factor for the less developed regions. We identify several types of regions: were regions-exporters of raw materials (Khanty-Mansi, Yamal-Nenets, Tatarstan, etc.), regions with advantageous geographical position (Leningrad, Kaluga, Primorsky Krai, Krasnodar region) and large agglomerations (Moscow, St. Petersburg) were leading in economic growth.



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# The cycles and the types of structural transformation in the various territorial social-economic systems of Pacific Russia

*Petr BAKLANOV (Russian Federation)*

All structural transformations in territorial social-economic systems (TSES) appeared to be the combination of sustainable changes in the structure of TSES extending from one link to another. Such changes can be connected with a sustainable growth (or decrease) of capacities of one of the enterprises of TSES, any kind of activity, the change of assortment of production or services, and also with the formation of a new enterprise or with liquidation of an existing one. The entire chain of similar changes in the combination of interconnected structural links of TSES from the first enterprise, knot, centre where a certain change has arisen to the last enterprise, knot, centre where the change has still manifested itself is considered as a cycle of structural transformation in TSES. The types of structural transformations are defined, first, by the type of the initial impulse of the structural changes (the growth, capacity decrease, assortment change, the formation of a new enterprise, liquidation of an existing enterprise or the kind of activity), and, secondly, by the combination of the structural links of TSES in which the structural changes occur, i.e. by the type of the cycle. For example, the cycle of structural transformations can become isolated in one knot, economic centre, settlement, and can extend in a number of structural links – in the interconnected combination of the knot and linear elements in the district. In the paper the various types and cycles of structural transformations in TSES of Pacific Russia are singled out and analyzed.



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**New dimensions of local and regional development in new Russia**

*Tatyana BOCHKAREVA (Russian Federation)*

Within last two decades process of local and regional development in new Russia underwent essential changes in connection with a number of factors such as administrative and institutional power change, the emergence of a market economy and social transformation, urbanization, new global and geopolitical challenges, strategic and spatial planning, implementation of infrastructure and event projects, the establishment of development institutions. First of all there were administrative- changes: areas, especially the republics, received more independent status as subjects of the Russian Federation; everywhere there was a formation of local government and self-management. Further strategy planning has become gradually an obligatory procedure in connection with spatial planning on all levels of authorities. Largest urban areas and regions of their location have received an additional government support as perspective territories of advanced development. So some regions and cities have received different conditions and opportunities for their development, but according to efforts of their authorities, business and public activities they have reached various results in economic and social development, attracting investments for new projects, financial and migration flows, etc. A competition for various kinds of resources has also become a strong factor of local and regional development in new Russia.



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# Import substitution - requisite condition for sustainable development of the region i n the modern conditions

*Elena INYAKINA, Tamara KHUDYAKOVA (Russian Federation)*

Sustainable development of the region is considered as a harmonious development of the stable production, social sphere, population and environment. The situation for the sustainable development of regions of Russia changed for the worse in recent years. The basic negative tendency – increase of cheap import of foodstuff, stagnation of industrial outputs, decrease of export ratio in foreign trade of regions. At different levels it was constantly talked about the need to modernize production, import substitution for the sustainable development of the regions. In the context of sanctions policy, imposed against our country, solution of these problems will not be in the long term, but in the next 3-4 years. Essentially import substitution – is the economic state strategy and industrial policy aimed at protecting domestic producers by replacing imported industrial goods by goods of national production. The result of import substitution should be increasing the competitiveness of the region – the territory ability to produce and provide services that meet the requirements of foreign markets by promoting the technological modernization of production, increasing its efficiency. The development of import substitution stimulates the demand for domestic goods, which would entail the expansion of production capacity, the formation of new industries under the influence of external conditions; job growth of population and improving standards of life in the regions.



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## Cultural geographical approach to agricultural landscape study of Russia

*Olga TRAPEZNIKOVA (Russian Federation)*

Though agricultural landscapes are usually studied by natural sciences (physical geography, ecology) nature environment is just a limiting factor for agriculture while social and economical issues determine agricultural development. At the same time rural settlement patterns are studied usually by economical geographers who do not pay enough attention on nature environment. We suggest interdisciplinary cultural geographical approach analyzing agricultural landscape including settlement pattern, as a traditional rural cultural landscape. We take Valday agricultural region as a study area. It was intensively agriculturally developed in the first half of the second millennium AC in spite of rather discouraging nature environment of Valday moraine hills. Nevertheless, it was a part of main agricultural and forest terrain where Russian medieval state formed. We analyzed historical transformations of the cultural landscape pattern of the area including settlement pattern, agricultural techniques, land use and tenure within the frame of certain nature environment. We revealed the boundaries and peculiarities of traditional cultural landscapes of contemporary surviving villages studying local placenames and sacral objects



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## General features and specifics of development of the rural area in Central Russia

*Tatiana BORODINA (Russian Federation)*

In the conditions of long-term demographic depopulation the migratory inflow is the only source of population growth in rural settlements in Central Russia. In areas attractive to migrants traditional factors of growth of settlements' population, such as favourable geographical location, large size of settlements, presence of central functions, continue to work. In demographically exhausted areas slight inflow of migrants can not break the tendency of full depopulation, which seems inevitable. Shrinking of the rural population combines with its concentration in larger settlements. Thus there is a process of polarization of settlement network - growth of a share of the largest and rapid growth of a share of smallest settlements due to reducing of medium-sized ones. Changes in the structure of rural settlements in certain areas can't be analyzed without the analysis of the settlement pattern and types, changes in their functional structure, transport framework, institutional features. Similar demographic and migration processes appear differently in regions with different historically inherited traits and different settlement pattern. Transformation of rural settlement pattern in post-Soviet period goes against the background of changes in the functions of many rural settlements. A lot of large agricultural enterprises are closed, so there are a reduction in the role of agriculture and its localization in separate points, the growth of the recreation use of the territory, including due to expansion of suburban areas, active introduction of new functions such as industrial production and transport-logistic functions. We can talk about increasing the role of subjective factors in the development and strengthening of variability.



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## The rural labour market in Central Russia: commuters and idlers

*Ksenia AVERKIEVA (Russian Federation)*

Traditional conception that rural population is employed in agriculture or forestry is outdated for many scientists, but is still actual for the government. Therefore the most part of rural inhabitants statistical data is collected by organizations of Ministry of Agriculture. The main part of data is tracked about agricultural employment in rural areas. The detailed data from census-2010 in Russia published in 2013-2014 gives more information about rural labour market except agriculture and forestry. Field trips helped make the information more exact. The huge part of rural inhabitants (around 29%) in working age has no work, but they aren`t jobless. The official data says about 2-4% unemployment. That people have some kinds of welfare payments (due to disability or after working in severe conditions) or they live on their relatives` money. The same part (29-31%) of rural inhabitants in working age works as commuters or even at long shifts, spending a week or more far away from home. It brings more money than local jobs, but it is really exhausting and often is a part of the shadow economy. Other part of rural inhabitants in working age has traditional for rural areas jobs as farmers (12-15%), social workers (10-12%) or in another local industries. The ratio of the above-mentioned groups depends on many factors. The most important of them are the transport accessibility and the quality of housing. The better they are the more part of inhabitants becomes commuters or works at shifts. In other cases (particularly on the periphery) rural people try to do one`s possible to find some kinds of welfare payments or to move to the big city to have a permanent residence there. The article was written with the support of the Russian Scientific Foundation (RNF №14-18-00083).



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# The request for sustainable regional development: Rural Society coping with innovations. A case study in the Altay Region

*Sebastian LENTZ (Germany)*

The Kulunda Steppe in the Altai Krai is an important agricultural region in the Russian economy. Since the 1950s, cultivation of arable land has been intensified with industrial measures, which led to significant ecological degradation. As well, agricultural yields have diminished and are still decreasing. The transformation after the dissolution of the USSR induced a re-configuration of property rights for regional economies and implemented market mechanisms. In the last decades, the restructuring of the regional economy and its subsequent direct embedding into the global economy enforced the pressure for ecological and economic adaptation for regional agriculture. Additionally, the rural society is confronted with a socioeconomic structural change through the exodus of young skilled labour. The paper presents outcomes of the interdisciplinary German-Russian research project "Kulunda: Ecological and Economic Strategies for Sustainable Land Management in the Russian Steppes". The project aims at developing impulses for sustainable regional development through the introduction of sustainable land use strategies with new technologies and steering instruments. For that purpose, it examines the interdependencies between ecological and social foundations of the rural society, as well as possibilities for implementing technological and social innovations on both regional and local levels. The paper discusses the methodological and practical challenges, which result from interdisciplinary and transdisciplinary collaboration of Russian and German research partners as well as from the cooperation with "practice", i.e. with farmers, agricultural corporations and enterprises, politics and educational organisations in order to create an impulse to sustainable development in the region.



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## Complex approaches in rural studies: similarities between French agrarian and Russian geography schools

*Olga SHUVALOVA, Mikhail PANTCHICHKINE (Russian Federation)*

Complex approach in rural studies is very comprehensive and widely used among geographers. Due to the aim of the research and also regional and national specificities, this approach can be employed in different aspects of rural development. This article represents two directions for estimation possibilities for future rural development. The discipline called "Comparative Agriculture" is a speciality of the French agrarian school, which also belongs to geography rural studies. Using a methodology based on field studies and complex approach, it focuses on defining previous and modern agrarian systems in many regions of the world (Mazoyer, 1997; Dufumier, 2004). It goes together with analyzing landscape and interviewing producers in order to model representative producing systems (Cochet, 2011, 2012). Modern Russian rural school is oriented on research of rural population (Nefedova, 2005). Rural area is developing due to variety of driving forces, mainly in economy and policy, but still local people are the main experts of their place of living (Alekseev, 1990; Tran, 2006). Therefore dynamic and spatial distribution of economic, social and environmental indicators based on statistic data goes together with interviewing inhabitant about possible ways of development (Shuvalova et al., 2014). Both researches claim that statistic data should not be the only one and the most valuable source of information for policy-makers. There is defended the "bottom-up" principle, which assumes that research and policy should start at local level in compliance with the interests of main stakeholders – inhabitants and producers. The combination of different methodologies using a complex approach should provide a relevant and far-reaching tool for local administrations.



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## Patterns Of Rural Development In The Coastal Districts Of Maharashtra State

*Dhanashree SURESH SHINDE (India)*

The continuous development process at the international, national and local levels has seen improvement in the health and prosperity of the people through diffusion of knowledge and technology. Every place lies at some level of development. Many countries cluster at the high and low continuum of development, and so can be divided into two groups, relatively developed and less developed country. Similar situation is witnessed in the local space. The levels of development vary due to disparities in the indicators of development including economic, social, demographic and political. The situation is not different in the rural parts of coastal Maharashtra State comprising of Mumbai, Thane, Raigad, Ratnagiri and Sindhudurg districts. This paper aims to demarcate patterns of rural development by constructing composite indicators at talukas level, using the measures of central tendency, dispersion and concentration index. The results thus obtained will be shown with the help of choropleth maps and relevant figures and diagrams.



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## Township and Village Enterprises and their Role in Modernization of China's Economy

*Ksenia MIRONENKO (Russian Federation)*

Development of Township and village enterprises (TVE) is a specific way of China's modernization, especially rural modernization. TVE are usually small, nongovernmental, nonagricultural enterprises, located in rural area. Nowadays TVE - 28% China's GDP, 49% of added value of industrial product, approximately 70% of added value of rural economy, 15% of taxes, and 1/3 of export. TVE are helping to solve the problem of rural unemployment, more than 160 million people (30% of rural labor forces) are working on TVE, every year new 3 million people are getting job at TVE. Growth rate of TVE is higher that growth rate of GDP. TVE also giving 35% of villager's income. TVE are presented by all sectors of economy, so development of TVE is causing diversification of rural economy of China. The most important sector of TVE is industry, main branches - machinery (20%), textile (16%) industry, metallurgy(15%), chemical (13%) and food (12%) industry. There are regional disparities in TVE development. Eastern region is the most developed (estimation: in 2015 - 56,3% of added value of TVE, although in 2010 - 58,7%), but the growth rate of TVE in Eastern region lower than in others. If we divide China in 3 region - East, Central, West - we can see, that 97% of East industry - is manufacturing industry; Central - 87%; West - 82%. Sectoral structure of industry in Eastern region is the same with country as a whole, but in other regions main branches are food industry and metallurgy. Food and textile industry are using agricultural raw material , located in rural area, so it is good to use it on TVE. As a result rural industrialization is uneven. TVE are playing an important role in urbanization. When enterprises are concentrating in one place they slowly changing from village to small town.



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# The directions of the local development of small towns – "Citta slow" in Poland

*Urszula KACZMAREK (Poland)*

The role of small towns in Poland has kept changing together with the policy of the country's development and the resulting processes of industrialisation and urbanisation. Today their chief growth impulse is an advantageous location in the zone of influence of metropolitan areas. Hence, small towns in Poland have to cope with a number of depopulation problems, a gradual disappearance of manufacturing functions, degradation of physical and service infrastructure, and no new investment supported by external means. In the face of this critical situation, small towns seek new directions of development, about the characteristics of sustainable development, based on local endogenous factors. A response to those modern challenges is the participation of 18 Polish small towns in the 'citta slow' network. This article aims to socio-economic characteristics of small towns that implement the development strategy of "slow" and to determine the specificity of the functioning of the Polish "Cittaslow".



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## Changes in land uses in Arab settlements in Israel: Urbanisation versus the shrinkage of agricultural areas

*Michael SOFER, Noaman GNAIM, Jallal GNAIM (Israel)*

The overall objective of this study is to assess the sustainability of agriculture in three Arab settlements of different size and different stages of urbanization in the Triangle area, Israel. This includes the characterization of land-use changes within the settlements, investigation of the changes in agricultural activities and survival strategies of the farming households, and the impact of agricultural production on the local environment. Study of changes in land uses was conducted in the three settlements for the period of mid 1940s to 2013 based on analysis of aerial photographs and satellite images. The land uses were classified into two main categories: urban areas and agricultural land areas which were divided to 7 sub-categories: built up areas, industrial activities, uncultivated land, farming land, orchards, greenhouses, and chicken coops. The analysis shows different rates of spread of built up area according to the settlement size and thus the changes in its economic base. In the larger settlement (Baqa El Garbiah) the urban area was significantly increased from 2% in 1944 to 53% in 2013 while the agricultural land area was drastically decreased from 98% to 45% during this period. Similar trends, slightly limited in their rates, were also observed in the other settlements investigated. Beside the decrease in agricultural lands, this trend points to the development of alternative sources of income, changes in the nature of infrastructure and various aspects that accompany the urbanization process. These trends are the product of local, as well as national level mechanisms.



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## Solar energy. Role and place in the global and regional development

*Varvara AKIMOVA (Russian Federation)*

Solar energy is one of the most rapidly growing industries of the world energy complex. Great potential for solar energy development is attributed to such global factors as the need to ensure national energy security, growing concern about the environmental consequences of the use of fossil energy sources, active innovative activity in the field of alternative energy sources etc. At the moment, solar energy still possesses a reasonably high level of territorial concentration at different levels, which shows in the dominance of individual countries and regions. For example, at the level of macroregions — 67% of photovoltaic capacity is concentrated in Europe, 68% of solar thermal (without CSP (concentrated solar power)) —in the Asia-Pacific region, 80% of concentrated solar power — in Europe. At country level there appears a similar situation: the leader in photovoltaics is Germany, which accounts for 32% of total power capacity, in solar thermal — China (about 50%), in concentrated solar power —Spain (76%). This trend is particularly noticeable at the in-country level, where the core is formed by 2-3 regions (Bavaria and Baden-Württemberg in Germany, California and Arizona in the United States, Qinghai in China, Extremadura and Andalusia in Spain, etc.). Thus, solar power still has focal type of placement, and such sharp contrasts are characteristics of the new "pioneer" industries, which is exactly what solar energy is. Nevertheless, the result of active development of solar energy is its dynamic spatial expansion, transforming its territorial structure from monocentric to polycentric.



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**Neoliberal Urbanization of Chinese Cities:**
**From the Perspective of Industrial Land Redevelopment in Lanzhou**

*Jie GUO (Germany)*

The political and economic practices in China in the past three decades show that the country's economy and society are seemingly moving along a neoliberal trajectory. The state withdraws itself from many fields of social welfare provision; instead, privatization, marketization and monetization are widely introduced. The new systems stimulate the urban housing and land markets and the emergence of entrepreneurial governments, which are largely responsible for the structural changes in many Chinese cities in recent decades. By identifying the characteristics of industrial land redevelopment in Lanzhou city, this study aims to explore the mechanism of China's urban land redevelopment through a neoliberal urbanism perspective, and discuss the respective roles of state and market during the process of land redevelopment as well as their interrelationship after the monetization and marketization of public resources, such as urban land and urban housing. Finally, it is found that redeveloping former industrial lands for the commercial and residential purposes becomes a mutually beneficial strategy for local authorities and enterprises. On the one hand, it helps government to increase fiscal revenue and improve urban infrastructure environment; on the other hand, it helps enterprises to raise relocation funds and solve the problems of laid-off employees' re-employment as well as employee housing. In addition, the results also indicate that local government is still the protagonist in the process of land redevelopment by virtue of the state-owned property of urban land. However, in order to alleviate the fiscal burden of governments and improve market efficiency, partial functions have already been spun off from administrative department and assumed by new agencies. Each of them plays a vital role respectively in the process of industrial enterprises' relocation, land transfer and redevelopment.



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# Post-Communist Urban Sprawl Related Built-Up Areas Dynamics In The Bucharest Metropolitan Area

*Ines Manuela GRIGORESCU, Gheorghe KUCSICSA, Bianca MITRICĂ, Irena MOCANU (Romania)*

Urban sprawl reflects the spatial dimension of urbanization beyond the city borders in relation to the urban-rural inter-linkages and the expansion of urban demand. In Romania, these transformations were also driven by the political and socio-economic transformations which took place after the fall of communist regime, generally recognized as major drivers of spatial changes. Bucharest Metropolitan Area acts an urban-rural structure organised into one core city (Bucharest) and over 100 administrative units (LAU 2 level) gathering over 2,500,000 inhabitants. The study-area is located in the south-eastern part of Romania, an area where the foremost spatial transformations trends refer to accelerate residential sprawl around main cities, slow-down of agricultural transitions and loss of pastures. As a result, new opportunities to reclaim agricultural, pastures and abandoned land for urban sprawl-related land uses emerge. The current paper is aiming to quantify the extent of urban sprawl in Bucharest Metropolitan Area using different GIS methods (ArcGis) and statistical regressions (SPSS) based on multi-temporal geospatial satellite images (LANDSAT 4-5 TM 1988/1990 and LANDSAT 4-5 TM 7ETM 2002 and 2014) and census data. Thus, the authors are able to conduct a series of complex spatial and temporal analysis of the build-up areas dynamics through relevant spatial indicators computed at LAU2 level: Expansion, Local Expansion, Annual Growth Rate, Trend and in relation to some of the main drivers of change (e.g. population growth, ageing, migration, employment, housing prefernces). Based on the resulted analyses current patterns of sprawl will be identified and subsequently, future sprawl can be predicted.



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# The Jobs-housing Relationship and Commuting in Guangzhou, China: Hukou System and the Persisting Dual Structure

*Liu YI, Li SIMING (China)*

In the western context, many excellent works had been conducted concerning jobs-housing relationship and commuting from various perspectives and many insightful findings were generated. However, given the social and institutional differences between China and the west, many of these findings may not be applicable in Chinese context (Zhou et al., 2014), some special set of conditions in China should not be overlooked, especially the residency control system, known as hukou system (Chan, 2012). China's market-oriented reforms since the late 1970s have tremendously changed structure and commuting patterns in Chinese mega-cites. Accompanied by the surge of rural-urban migration, the transport related problems like traffic congestion and lengthy commuting attract more and more attention. Nevertheless, thorough understanding of fore-mentioned issues in Chinese context required more attention on the "dual structure" in urban China, which was created by longstanding hukou system. The present paper uses survey data from a household survey conducted in Guangzhou by research team led by Li Si-ming in 2010. To investigate the interrelation between jobs-housing relation, commuting and hukou status, several structural equation models are established. The findings suggest that 1) local hukou population is more centralized than non-local hukou population in terms of both residential and employment location; 2) non-local hukou population is less likely to conduct inter-zones commute; 3) local hukou population has considerable longer commuting trips and much higher usage of private cars than non-local hukou population. The result implies that, hukou system exerts substantial influence on people's jobs-housing choices and commuting behaviors, and any formation of policies intent to ease transportation problems in China should take the "dual structure" and hukou system into consideration.



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## Geography of Slums: The Unresolved Paradigm of Slum Improvement Initiatives in India

*Kanika BASU, Sumana BANDYOPADHYAY (India)*

Abstract Across developing countries, large cities are competing as destinations for investing surplus capital. Captivated by the goals of global networks, every region aims to develop itself as globally and universally competent. Development of a region largely rests upon the synergies between the urban places and their surroundings. However, cities are also home to pollution, crowding and slums – factors which erode the efficiency of urban spaces as global investment hubs. Slums absorb most of the impacts of planning. Infrastructure, provisioning, beautification – whatever the task, slums are perceived as antithetic to the planned city, which necessitates their up-gradation or improvement. While the city rests heavily upon slums (a thriving informal sector actively maintaining the city), they seem to pose a threat to the planners' vision of a landscaped efficient global city. Since Independence, efforts for slum development in India have been consistent, through the successive Five Year Plans, it has been on the agenda of policy planners, albeit, in many avatars - from slum removal and clearance, environmental improvement and finally, the recently launched Slum Free City Plan of Action (SFCPoA) that envisages a slum free India. While policy is primarily ameliorative, the approach till date has completely ignored the 'geography of slums' in India. This paper statistically illustrates that it is not rapid urbanization, but an urban policy and development dialogue that ignores the balanced regional planning paradigm that influences the incidence and persistence of slums in India's urban space. It also seeks to argue that, choosing to ignore this essential paradigm may reinforce the already existing imbalance in urban structure, thereby affecting both local and regional development.



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# Overseas operations of local firms and cross-border management: A case study of Japanese local firms

*Atsushi TAIRA (Japan)*

This study aims to examine characteristics of the international business of small and medium-sized firms (SMFs) through a case study of Japanese local firms. Here, 'local firms' refer to those which have their headquarters outside the major Japanese metropolitan areas such as Tokyo. The majority of local firms consist of SMFs. In Japan, 99 percent of firms are SMFs, making up about 70 percent of total employment. In many cases these firms make local industry complexes, or Jiba sangyo in Japanese. Such local industries have suffered from a long economic recession and globalization of economic activities. There are, however, some examples of local firms which have been surviving through expanding overseas operations and international business. Some firms have even succeeded in increasing the number of their domestic employees by returning the profits earned overseas into their headquarters in Japan. A potential is leading firms which could be a model for others in the region. Nippura is a good example. This firm, founded in 1969, is located in Miki, Kagawa. It has developed a specialized technology to make large scale water tanks. So far, the firm has produced over 300 large water tanks for zoos and aquariums not only in Japan but also for overseas market, making up about 70 percent of the world share. From now on, "collaborative competition" and "diversity" of related firms can be utilized to make local firms and local industrial complexes more competitive in the contemporary era. Leading firms will play an important role there through cross-border management not only in terms of the county of operations but also in the types of industry.



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## Determining social dimension of vulnerability in Romania by exploratory spatial data analysis

*Ibolya TOROK (Romania)*

The uneven development of a certain territory, especially the existing disparities between urban centers and rural areas can greatly determine the population's vulnerability in the face of natural hazards. The increasing importance and attention given to natural hazards in numerous papers at national and international level towards the end of the 20th century and the beginning of the 21st century is largely due to the increasing impact of natural phenomena on society as well as the environment, generating at the same time major dysfunctions. Understanding the mechanism and origins of hazardous phenomena and their relation to other factors they influence are indispensable when studying natural hazards and risks, but the socio-economic and environmental dimension of vulnerability which could be influenced by policy interventions and through adequate planning are important as well. The paper examines the social dimension of vulnerability in Romania using exploratory spatial data analysis in order to determine the presence and location of socially vulnerable groups. The main reason for choosing the mentioned area is given by its agricultural profile and hence the fact that almost all economic activities are related in one way or another to the area's natural resources, often subject to adverse natural conditions induced by natural hazards.



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# Territorial Disarray And Competition Between High-Speed Railway Stations Outside Medium-Sized Cities And Conventional Railway Stations: A Failed Attempt To Co-Ordinating Urban Development And Railway Stations As A Component Of Urban Sustainability

*Carmen VÁZQUEZ, Carmen BELLET, José MARTÍNEZ (Spain)*

This contribution is part of the dissemination work of the research project "Modes of urban transformation and strategies related to high speed rail in Spain. (URBATAV)". In this project, one of the objectives focus on urban transformations generated by the physical embodiment of the railway infrastructure of high speed (its integration degree and the existing degree of consistency with the physical planning), as well as urban projects related to it. In Spain, mostly as a result of local and regional pressure, 8 of the 31 stations in small and medium-sized cities with HSR services are peripherally located. This is the case of Puente Genil-Herrera, Antequera-Santa Ana, Segovia, Guadalajara-Yebes, Camp de Tarragona, Cuenca, Villena and Requena-Utiel. In this context, we intend to analyze the origin and consequences of the introduction of high speed stations in locations (between 5 and 6 km) away from the urban centres of the four Spanish small/medium-sized cities: Cuenca, Villena, Requena and Utiel, while retaining the central conventional railway stations. We shall try to assess the role of both central/local institutions and agencies in developing and reshaping the settled space. The paper that we present here follows a joint, quantitative-qualitative research methodology, in which the weight of semi-structured interviews with key informants (4 for each case study) has been fundamental, we tried to assess the inclusion of high speed in urban areas: the process of full implementation of the new high-speed railway infrastructure, its relationship with the classic rail network, and processes of urban transformation / territorial disarticulation their implementation and scheduling has raised.



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## Evidence of economic activity shift from Atlantic to Pacific region

*Oleg SINYUGIN, Mikhail BEREZKIN (Russian Federation)*

Hypothesis by famous 19 century geographer Friedrich Ratzel about the shift of economic activity from Atlantic to Pacific has been substantiated in the end of the 20th century. Trade and investment data have been analyzed in order to provide statistical background for this issue. Given exchange rate fluctuations, Pacific regional trade definitely surpasses Atlantic one since the mid-1990's. Pacific trade could be well estimated by intra-regional Asia Pacific Economic Cooperation (APEC) trade data. In 2013 the volume of merchandise exports and imports in the Pacific basin totaled 12.3 trillion dollars US comparing to 9.2 trillion dollars US in Atlantic. There is no single proxy for Atlantic basin trade. Atlantic trade comprises 4 components: 1) European Union (EU) trade, 2) MERCOSUR (combines Argentina, Uruguay, Paraguay, Brazil and Venezuela since 2012) trade, 3) Africa's trade (excluding Eastern Africa) and 4) Caribbean trade. EU dominates Atlantic basin trade accounting for 92% of the whole volume. Trading gap between Atlantic and Pacific is widening in the beginning of 21st century. Nominal value of total trade by APEC members grew at an annual rate of 8.5% in 1990-2013, while EU trade increased at an average pace of 4.4%. Investment is a key driver of economic development. Pacific foreign direct investments (FDI) inflows firmly exceed Atlantic bound FDI since 2008. Thus, aggregated FDI inflows in Atlantic region have reached 36% of global FDI in 2013. APEC economies received 54% of global FDI inflows in 2013, they are also the net FDI contributor for the other world. Pacific region strengthens it's geoeconomic leadership over Atlantic in the 21st century.



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## Environmental Flows Management In A Context Of Green Development

*Alla PAKINA (Russian Federation)*

Green development is a concept considered effectiveness of nature management in environmental, economical and social context. During the last decades many countries implemented policies aimed to reduce ecological impact while maintaining economic growth and focusing social needs. Green development is one of priorities of Russian modernization as well. Crucial point in this intention is an evaluation of effectiveness of natural resources use. Market principles – GDP (or GRP) as a main economic indicator of development – do not reflect degradation of natural landscapes and damage from pollution of natural environment. In this regard, green development must be based not on traditional economic indicators, but innovative criterion, with attention to ecological and geographical factors. One of possible approaches is based on indicators of the System of Environmental-Economic Accounting (SEEA). In regard to landscapes, carrying capacity of natural ecosystems, intensity of material and energy flows in landscapes, changes in terrestrial albedo coefficient due to land use structure and others features and ecosystems' services should be taken into account. It is widely known that benefits from conservation of natural ecosystems greatly exceed the revenues from resource extraction – in most cases an excess depends only on the length of time perspective. Preliminary evaluation of changes in natural landscapes was conducted for the Republic of Buryatia. Accounting of ecological services and intensity of environmental flows in landscapes form a base for a more effective regional economy in a way of green development.



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# Multi-planning Coordination State and a Collaborative Solution for Urban Agglomeration Planning in China

*Guo RUI, Fan JIE, Chen DONG, Wang YAFEI (*China*)*

Urban agglomeration has been the inevitable result of China's rapid industrialization and urbanization over the last 30 years. China has declared urban agglomeration the main spatial component of new types of urbanization over the next decade as clarified at the first Central Urbanization Working Conference and in the National New-type urbanization plan (2014-2020). Accordingly urban agglomeration planning as a brand new type of planning will become more important. However, based on existing features of China's planning system, there are serious conflict and incoordination between upper and lower planning of urban agglomeration planning. And the core value and position of these planning are clarified. Then the main content of urban agglomeration planning oriented to coordinated planning system is explicit: The first is comprehensive planning of one urban agglomeration in coordination with another's, the second is planning for one interior zone of urban agglomeration in coordination with another interior zone. Then the problems and reasons of multi-planning coordination in urban agglomerations are analyzed. Also in order to analyze the reasonable and unreasonable component of collaborative planning, the contradiction and conflict are judged by using collaborative state analysis method at general and special planning level respectively. In the end, the author puts forward a path, which need the top-level design, to unify multi-planning under urban agglomeration, such as innovate institutional mechanism of collaborative planning and complete the spatial planning system.



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# From Strategic Coupling to Decoupling and Recoupling: Changing Dynamics of Global Production Networks and Evolution of Regional Development in China

*Chun YANG (*China*)*

The global production networks (GPNs) perspective, especially its focal concept of "strategic coupling" has been widely applied to regional studies in the era of globalization. The 2000s, especially the aftermath of the 2008 global financial crisis, has witnessed changing dynamics of GPNs which has engendered the refinement of GPNs perspective, the so-called GPN 2.0 (Yeung and Coe, 2015). In echoing to the updated conceptualization of GPNs perspective, this study postulates that regional trajectories have been reshaped by the transition from strategic coupling to recoupling and decoupling, as a result of regional selection and abandonment of transnational corporations (TNCs) in varied host regions in China. Based on updated field investigation and in-depth interviews prior and after the 2008 global financial crisis, this study examines and compares the transformation of the cross-border production networks driven by Hong Kong and Taiwan-based TNCs, particularly their divergent engagements in decoupling from source regions in coastal China, e.g. the Pearl River Delta and recoupling with the inland provinces, such as Sichuan and Hubei. Particular attention is paid to the changing power relations among TNCs and concerned regions with the emergence of key supplier-led domestic market-oriented production networks in China. Through developing an evolutionary framework on strategic coupling, the paper puts forward pertinent topics on the research agenda to explore dynamic interaction between GPN restructuring and regional evolution in the contemporary global economy.



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## Development of Backward Regions in India: Issues and Concern

*Krishna MOHAN (*India*)*

Backward Regions Grant Fund (BRGF) that was started by United Progressive Alliance (UPA) Government in 2007 in India indicates the concern for addressing the regional imbalances. The National Democratic Alliance (NDA) which took over in May 2014 may look at BRGF afresh. In reality, BRGF should be called as Backward Districts Grant Fund (BDGF) that provides financial supports to identified backward districts. The issue of developing backward areas prior to Tenth Plan was addressed in three ways (i) by distributing the Central Assistance in a manner to favour the less developed states such as special category states (ii) incentive based investment through private entrepreneurs such as central investment subsidy, concessional loans, tax holiday, transport subsidy etc. and (iii) through special area programmes for hill, tribal, drought prone, desert, border etc. Realizing the responsibility of distributive justice, a new approach to target backward areas through a specific programme for Backward Areas culminated in Rashtriya Sam Vikas Yojana (RSVY) in 2003-04. In all, 147 districts (115 backward and 32 Left Wing extremist districts were identified.. The present paper reflects on the criteria of identification. It provides a spatial view of the area covered under the programme. It highlights the shortsightedness of planners that very quickly change the criteria for identification, under political compulsions, compromising long term benefits. It further questions the outcome of various backward area development programmes. In other words, why such programmes fail to yield? The latest NITI Aayog gives hope.



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**Origin Effects, Spatial Dynamics and Redistribution of FDI in Guangdong, China**

*Hua Xu, Anthony YEH (*China*)*

Based on panel regression analysis and interviews of 70 foreign-invested enterprises (FIEs), this paper compares the spatial dynamics and redistribution of foreign direct investment (FDI) from Hong Kong, Taiwan, Japan, and the US in Guangdong province. We found that FDI in Guangdong tends to favour cities closer to Hong Kong, with lower wage rates, better market potential and more preferential policies, and to follow the agglomeration of FDI from the same origin. The diverse home-based characteristics have resulted into the varied pathways of spatial redistribution of FDI. Hong Kong FIEs have been searching for lower-cost regions given the rise of production cost and tightened environmental regulation. In contrast, the redistribution of FIEs from Japan and Taiwan are more sensitive to their home-based business linkages, whereas Japanese and the US FIEs tend to value access to domestic market and to expand in large cities outside Guangdong.



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## Regional resources and environment carrying capacity model for earthquake area planning

*Yafei WANG, Fan JIE, Chen DONG, Guo RUI (China)*

As an important carrier of interaction of man land relationship, resources and environment carrying capacity is becoming the basic premise and basis of regional development and spatial planning. Earthquake area has the most intense interactions between the various spheres of the earth surface and human-environment relationship is under great stress. This paper takes the Lu Dian earthquake area in China as the example, and presents the resources and environment carrying capacity model, whose function parameters include land resources, water resources, environment capacity, ecological importance and fragility, and disaster risk. Some economic development factors, such as economic development level, population concentration and transport superiority, are also considered in the evaluation. Finally, the study area is divided into population concentration zoning, agriculture zoning, ecological zoning, and disaster prevention zoning, according to the results of the model, thus providing a scientific basis for the proposed recommendations for restrictive measures and scientific planning.



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## Gold Mining and Sustainable Development in Saudi Arabia

*Mohammed ALDAGHEIRI (Saudi Arabia)*

The natural resources of the Kingdom of Saudi Arabia are highly diverse, both in terms of their variety and their location throughout the country. The Saudi Arabian soil has a large variety of metallic and non-metallic mineral resources that range in size and value occurrences of limited potential to deposits large enough to sustain profitable exploitation. This paper examines the gold mining which is considering one of the metallic minerals important to the economy of the Kingdom of Saudi Arabia, focusing on its production, geographical distribution and its effects on sustainable development.



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# Local and regional development in the Great Eastern Venezuela : an example of "pioneer" local and regional development

*Anne PENE-ANNETTE (France)*

The concept of development zone is back with force in Venezuela since the early 2000s, as a fundament for territorial planning. It applies to the Greater East, geographical construction that we propose to enhance the territorial dynamics between Oriente (north east Caribbean coast of Venezuela) and the Venezuelan Guayana. At the same time, the Orinoco Socialist Project (PSO) is the key component of the development plan for the «Orinoco Belt» (FPO), which occupies the south eastern strip of the Orinoco river basin. With it, the government envisions a fundamental change of Venezuelan society, politically and ideologically, but also regarding its organization and territorial dynamics. The national oil company PDVSA plans, to produce, through 2021, about six million barrels of oil per day, in an area equal to 7 per cent of the whole country. In our presentation, we analyze and envisage a wide range of impacts regarding social, environmental, issues at the local and regional levels (as metropolitan dynamics and the case of access to basic urban services).



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## Special aspects of territorial and productive combinations in modern Russia

*Andrey LUCHNIKOV , T.A. BALINA, N.D. EROPKINA, M.B. IVANOVA, B.A. KAZAKOV, A.M. KOROBEYNIKOV, A.A. LYADOVA, S.A. MERKUSHEV, R.S. NIKOLAEV, V.V. REZVYKH, V.A. STOLBOV, T.V. SUBBOTINA, L.Yu. CHEKMENEVA, L.B. CHUPINA, P.S. SHIRINKIN (Russian Federation)*

Modern conditions of Russian society's development demonstrate new demands for the territorial organization of the economy. Firstly, the development of territorial and productive combinations must take into account a complex of conditions existing on the territory of their allocation. The consideration of regional peculiarities will give an impetus for positive transformations and will mitigate negative effects. Secondly, the optimization of the territorial organization of the economy must take into consideration the territorial specialization and participation of enterprises forming a territorial group or complex in the international, all-Russian and trans-regional division and integration of labour, capital, etc. Thirdly, the formation of territorial and productive combinations must be based on resource and energy cycles which are organized as chains of interrelated economic effective activities functioning in the form of continuous staged processes. Fourthly, the objects of market and transport-logistic infrastructure must be major components of territorial and productive combinations. They will organize channels of links between participants of a productive complex and the external environment. Fifthly, scientific organizations must contribute to the sustainable development of territorial and productive combinations and their competiveness. Sixthly, the collaboration of private firms and governmental bodies will lead to the use of effective models of the territorial organization of the economy, such as a territorial cluster. It is a complex of interrelated and cooperating industries and activities on a compact territory, which exists thanks to the alliance of technologic operations, resource and energy cycles and creates the conditions for increasing territorial competiveness.



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# Municipal Reform of Rural Settlements in Old Developed Regions of Russia: Problems of Territorial Organization

*Zinaida PONOMARYOVA (Russian Federation)*

Territorial basis of local self-government – an aggregate established by the Constitution of Russian Federation and the federal laws of legal norms that consolidate and regulate the territorial organization of local self-government, the formation and structure of the municipalities, the establishment and transformation of their borders. The borders of rural settlements of old developed Russian regions are characterized by stability, extreme inertia, resistance and stiffness. Under the changed socio-economic situation, they've become a barrier of territory development, reforming and transformation. Criteria of establishment territorial limits of municipalities are established in legislative documents of regions of the Russian Federation. Improvement of territorial organization of local self-government in system of the rural settlements should be carried out based on the following methodological algorithm: – taking into account historical, geographical, socio-economic factors, the current infrastructure and rural resettlement of the population; – revealing of types of local systems of rural settlements and external connectivity with the administrative centre of the municipal district; – substantiation of social and economic independence of municipalities based on assessment of the financial and fiscal capacities; – definition of funding resources economy by means of consolidation of rural settlements and reduction of municipal employee number. Consolidation of rural settlements will create full-fledged inter-farms centres to improve the internal connection of settlements and availability of getting qualitative municipal services, to make active the formation and development of territorial public self-government.



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## Medium-sized cities in the system of settlement of Central Russia

*Ilya SMIRNOV, Alexandra FOMKINA (Russian Federation)*

Medium-sized cities (50 000 – 100 000 people) are the units of the settlement framework for the vast territory of the country. They are found in between large cities and small towns. Medium-sized cities are the cores of economic, demographic, social and cultural attraction of the surrounding area. Most of the urban people in non-capital regions of Central Russia live in cities with population size of over 100 thousand people. Some regions differ by high concentration of population in the medium-sized cities (24-31%) - Smolensk, Tver, Tambov, Tula, Ivanovo regions. In these regions, the medium-sized cities adopt a role of the territory organizers, which supply small towns and rural areas. The medium-sized cities perform some functions, which are incidental to large cities. Medium-sized cities also have a high potential for control of the surrounding area, one in three city in this category is the center of economic microregion. Together with submedium cities (20-100 thousand people) medium-sized cities control 46% of the territory, 41% of municipalities and 26% of the population. Non-capital regions of Central Russia can be divided into three groups depending on the types of cities which control and organize the territory. The first group includes the regions where the large cities assume the role of sub-centers. This group includes Vladimir, Tula, Lipetsk and Yaroslavl regions. The second group, the largest one, includes regions where the role of sub-centers belongs to medium-sized and submedium cities (10 regions). The third (the smallest) group is composed by the regions where small towns fulfil a function of sub-centers. About half of municipalities are controlled by the regional centers. Analysis of changes in the urban structure of the non-capital regions in Central Russia demonstrates a trend of polarization of urban settlement: increasing percent of large cities, as well as the number and proportion of small towns. Part of the medium-sized cities are losing their population, there is an "erosion" of this group. In connection therewith, the important research problems are to identify the strengths and development's prospects of medium-sized cities and to work out the special measures aimed to maintaining their demographic and economic sustainability.



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## Economic-geographical aspect of the quality of life population of Penza region

*Natalya SIMAKOVA (Russian Federation)*

The paper analyzes the regional characteristics of population quality on the example of the Penza region. The main trend of the last decades is the General decline in the quality of the region's population. One of the main factors of this process is the increase in the incidence and consequence - reducing life expectancy. Morbidity by main groups of diseases has increased from 80.5 thousand people in 2000 to 113,5 thousand in 2013, per 100 thousand inhabitants. Due to increased mortality from 12.1% in 1985 to 18.2% in 2005, average life expectancy has declined from 70.5 years to 65.5 years. Especially noticeable decrease in mean life span of men to 58.6 years, 14.7 years below the mean life span of women. One of the main reasons for the decline of population quality is the lower level of average monthly cash income (18.226 thousand. Rub. In 2013) and the average monthly wage (20.168 thousand. Rub. In 2013) residents of the Penza region in comparison with other subjects of the Volga federal District and Russia as a whole, though, according to the Ministry of Economy of the Penza region, these figures have increased compared to 2012, respectively, 8.1% and 6.6%. This has affected the emergence of positive trends in the field of population: there was a decrease in mortality to 14.8% by 2014 and increase in life expectancy to 71.5 years. Analysis of statistical indicators has allowed to reveal quite significant differentiation of regions of the Penza region on the qualitative characteristics of the population. Particularly large differences between the suburban and peripheral regions.



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## Interaction of Transformation of Territorial Structure of the Russian Higher School and Regional Development

*Alexander KATROVSKY (Russian Federation)*

To meet national and regional interests it is necessary to enhance the role of regions in professional training. Today a large concentration of higher schools can be found in Moscow and St. Petersburg. In this situation the polycentric model of the educational space development becomes of utmost importance since it has federal, research and regional universities as its core elements. Owing to their great scientific potential, such educational institutions should become a "locomotive" of regional innovation development.



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# Effective use of natural capital as the factor of sustainable development in subsidized regions (Evidence from Kirovskaya Oblast)

*G.D. MUKHIN (Russian Federation)*

According to the World Bank conception "Expanding the Measure of Wealth – Indicators of Environmentally Sustainable Development" the value of natural capital in the national wealth has been assessed for Kirovskaya oblast as typical subsidized region in the European Russia. The natural capital calculations have been carried out in national currency and at the base of cadastre data for majority of natural resources. The natural capital of Kirovskaya oblast has been calculated as cumulative cost of mineral, agricultural, timber resources, non-timber forest products, specially protected nature areas, recreation areas, including genuine savings and environment damage. Total cost of the region natural capital is 520 mlrd. rub while renewable nature resources give 95%; prevailingly agricultural lands (330 mlrd.rub) and timber resources (130 mlrd.rub). The cost of produced assets allowing for wear is 412 mlrd. rub. A human capital is assesssed as about 1,0 trln.rub. These three components of the national wealth give the ratio: 27:21, 3:51,7%. Such a structure of national wealth is usual for developing countries and regions exporting nature resources. Relating to Kirovskaya oblast deficient for exportable mineral resources the sustainable development needs in mobilization of renewable nature resources while their potential is little used. Nature resources of the region are rather safe due to relatively little environmental outlay. Fertility potential of rural lands is used only by half because of lands' abandoning. Forest timber and non-timber resources are also incompletely used. Recreation and environmental functions have great potential for region development. In order to mobilize and completely use renewable nature resources it is necessary first of all to work out transport, settlement, market infrastructure. The agriculture and forestry production as well as recreation services may increase twice and thrice the export potential, so the region may become self-sufficing.



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**Recreation and tourism in the actual restructuring of Crimea coast nature management**

*Olga BLINOVA, Tatyana KOROL (Russian Federation)*

Health resort and tourist, transport and logistics and the agricultural sectors are recognized as priority areas for the Crimea development. The geopolitical situation of the present time has shown that there are prerequisites for the actualization of the peninsula recreational potential. To realize the advantage of the Crimea strategically required spatial restructuring of tourist regions through the development of new territories and the construction of tourist accommodation objects in undeveloped regions with high potential landscape diversity and historical monuments. In addition, Crimea requires the accelerated development of transport communications, to overcome the existing artificial or natural isolation tourist subregions. Realization of modern tourism development programs in Crimea is complicated by means of deteriorating environmental situation and increasing number of anthropogenic impacts on the environment. Adverse natural processes, increased by the impact of anthropogenic factors cast doubt on the prospects for sustainable management of recreational use. In this regard, it is necessary to develop innovative concepts - sustainability strategies of landscape systems and their resource and environmental potentials. Long-term program of sustainable tourism development of the Crimea should be based on the consist, condition, rating of existing and potential resource and save the aesthetics qualities and functions of peninsula landscapes, as well as determined by the level of knowledge, technical capabilities, economic and social feasibility of their use and consumption restriction. Thus, a comprehensive realization of the spa treatment potential and tourism through implementation of innovative technologies in recreational activities, new market segments in recreational services development, optimize the recreational complex structure, should reduce its negative impact on the environment and natural resources of the peninsula.
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# The Identifying And Mapping Of Environmental Management Restrictions For The Bolshezemelskaya Tundra Cryolithozone

*T.Yu.ZENGINA, G.G.OSADTCHAYA (Russian Federation)*

The current approach to the exploitation of cryolithozone hydrocarbon resources must be reconsidered in order to preserve Bolshezemelskaya Tundra. Suggested the technique of determining environmental management restrictions, providing a limitation of performing area and preservation of biosphere significant territories of Bolshezemelskaya Tundra, as well as the possibility of accounting not only economic, but also an ecological and social functions of the territory. It is proposed to clearly define the restrictions to environmental management at pre-investment stage, and to consider as a priority placement of production facilities the areas with no restrictions. A preliminary medium or large-scale mapping of the territories designed to the development can become an effective measure to implement the environmental management restrictions on the administrative and legislative level. The technique is based on the identification and different scale mapping of proposed types of the restrictions for nature management: legislative, environmental (ecological), engineering-geological (geotechnical), and nature-resource restrictions. A medium-scale mapping is proposed to carry out base on the identification of ecological framework of region, for each element of which restrictions for nature management must be defined. The large-scale mapping of the restrictions on environmental management was suggested to base on the landscape approach, differentiated for natural sub-zones, and within them - at the level of stows. The Usinsk administrative region of the Republic of Komi was chosen as a model area for testing methods for determining and mapping of the environmental management restrictions.



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## Regional and local geographical potential of renewable energy sources in Russia

*Alexander A.SOLOVYEV, Kirill S.DEGTYAREV, Alim M. ZALIKHANOV, Konstantin V. CHEKAREV (Russian Federation)*

The energy plays crucial role in socio-economic developments at international, national and local level. At present there are aspects of energy use that are incompatible with the goal of sustainable development. One of the ways to provide sustainable development is increased reliance on renewable energy. There are studies that have analysed the theoretical potential of renewable resources, but they do not allow estimating energy reserves available for practical use. Renewable energy sources depend on geographical conditions and their potential is needed to be detailed, taking into account the availability of territories in the region. The additional insights gained in this work are based on assessing of regional and local geographical potentials of renewable energy sources in a uniform way using a territorial approach. It includes changes in land use patterns, taking into account the spatial density of allocation of renewable energy systems. For the analysis of the geographical potential we use following definition: geographical potential is the part of the technical feasibility of renewable energy available at areas that are considered accessible and suitable for production of energy. We investigated the geographical potentials of wind, solar, biomass for different Russian regions. The calculations allowed range the territories of Russia at the regional and local levels from the point of view renewable energy resources available in the amounts necessary for energy supply. The goal of this is sustainable socio-economic development and environmental protection. Geographic potential is also a good tool to compare renewable and traditional energy sources in management decisions regarding the prospects of territorial development.



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## Fires in the technosphere as regional development risks: the spatial and temporal dynamics

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Technosphere fires is one of the sources of economic, social and environmental risks of development of regions. The severity of these risks varies in space and in time. Spatial dynamics repeatability modern fires is determined by the joint influence of the region's population number and the harsh conditions of the cold period. In the same region the importance of these factors may be different for urban and rural population. Comparison of the statistics of the fires of the late 19th and early 21st centuries has shown that moving large parts of the population in the city has resulted in the reduction of per capita number of fires, smoothing interseasonal differences in the frequency of their occurrence and the change of the seasons of maximum and minimum frequency of fires. The vast majority of the fires of the past and present have reasons associated with states and processes in society. In the 21st century they were responsible for 50 - 90%% of all fires in different regions. Some of them have deep social and cultural roots (carelessness, arson), has retained its significance level for over 100 years.



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## Special aspects of territorial and productive combinations in modern Russia

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Modern conditions of Russian society's development demonstrate new demands for the territorial organization of the economy. Firstly, the development of territorial and productive combinations must take into account a complex of conditions existing on the territory of their allocation. The consideration of regional peculiarities will give an impetus for positive transformations and will mitigate negative effects. Secondly, the optimization of the territorial organization of the economy must take into consideration the territorial specialization and participation of enterprises forming a territorial group or complex in the international, all-Russian and trans-regional division and integration of labour, capital, etc. Thirdly, the formation of territorial and productive combinations must be based on resource and energy cycles which are organized as chains of interrelated economic effective activities functioning in the form of continuous staged processes. Fourthly, the objects of market and transport-logistic infrastructure must be major components of territorial and productive combinations. They will organize channels of links between participants of a productive complex and the external environment. Fifthly, scientific organizations must contribute to the sustainable development of territorial and productive combinations and their competiveness. Sixthly, the collaboration of private firms and governmental bodies will lead to the use of effective models of the territorial organization of the economy, such as a territorial cluster. It is a complex of interrelated and cooperating industries and activities on a compact territory, which exists thanks to the alliance of technologic operations, resource and energy cycles and creates the conditions for increasing territorial competiveness.



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**Reproduced Natural Resources in the Regional Development of modern Russia**

*Irina VOLKOVA (Russian Federation)*

The lack of investments into the basic production assets in branches of Reproduced Natural Resources Use is fixed in modern Russia. Many assets in these branches during the last 20 years were actually ownerless that led to their destruction. It causes high rates of tear and wear of the basic production assets, infrastructure and the lack of reproduction of Natural Resources. Private owners and tenants in branches of Reproduced Natural Resources Use in modern Russia have no interest and financial opportunity to reproduce natural resources because of too long term of their reproduction considerably exceeding a business cycle and considerable investments in infrastructure. In this regard we offer to apply some standards of the accelerated depreciation of the basic production assets to the branches connected with the Reproduced Natural Resources differentiated on regions. For ensuring processes of reproduction of Natural Resources from positions of society we offer the system of priorities for different territorial levels: - at the local territorial level the reproduction of conditions of life support of the population (surface and underground water, woods as recreation conditions, etc.) is to be priority; - at the regional territorial level the reproduction of the Natural Resources realized not only for export, but also within the country, for development of production in this region is to be priority; - at the national level the reproduction of those Natural Resources which have special value for export is to be priority. The infrastructure for a reproduction of Natural Resources at all territorial levels has to be transferred under responsibility of the state and the budgetary financing.



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## Geoecological problems of the regions in Russia

*Ekaterina BULDAKOVA, V.G. ZAIKANOV, T.B. MINAKOVA, I.N. ZAIKANOVA, I.S. SAVISKO, U.P. TOLSTAYA(Russian Federation)*

Considerable space regions-subjects of the Russian Federation, cause huge differences in the availability of natural resources, uneven economic development and intensity of anthropogenic loads, distribution of dangerous natural processes and phenomena. This determines the appearance and the set of environmental problems in each of the subjects. The severity of environmental problems can be expressed in quantitative form by the end of geoecological assessment. The main criterion for geoecological assessment is the stability of geosystems in the region, the low level which indicates the presence of problems or complex. Developed approach to geo-environmental assessment was approved on the territories of several regions and has proven its effectiveness. Despite huge differences in natural and economic regions of the Middle and the Asian parts of Russia, have been identified as within regional characteristics, and the total inter-regional regularities of formation of environmental problems. The main common problems include: - natural resource potential determines the geo-ecological stability of the region as a whole; - the damage from the negative impact of natural processes and anthropogenic impacts depends largely on their spread, not severity. Individual problems - high natural resource potential does not always determine and high stability, with a significant impact on the sustainability of the natural complex of human activity or endogenous, exogenous and cryogenic geological processes and phenomena - this pattern is broken; minimum stability characteristic of intrazonal landscapes, due to the increased anthropogenic impact; - a higher level of stability characteristic of those geosystems, where the land balance is dominated by natural ingredients, preserved in a natural or close-to-state; for all geosystems remains relevant the preservation or restoration of geo-ecological stability, including the development of protected areas.



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# Conditions of Development, Current Situation, and Quality Management in the Cities and Districts (Concept and Methods of Evaluation)

*Alexander TKACHENKO, L.P. BOGDANOVA, A.S.SHYUKINA (Russian Federation)*

Unequal conditions of the development of the cities and districts, necessitates measures of selective support on the part of regional authorities. Algorithm of selection of territories that are supposed to get support from regional authorities must be most impartial. The following report presents methodic for evaluation of social and economic situation in municipal districts of Tver Region. System of evaluation consists of 3 parts. 1. Basic indicators reflect historical differences in economic situation and geographic location, economic potential and demography. Those particular indicators are the most accelerative and its alteration unlikely. 2. Indicators of social risks zones (twilight zones) depict the demographic structure and peculiarities of settlement considered access to most important services. 3. Indicators of current state connected with certain activities of population, authorities and business within the last two years. Such indicators as economic activity, labor market, and demographic processes are changing during short time period. The logic of evaluation is quite simple. Basic indicators determine the most common conditions for development. Indicators of social risks reflect the results of development within the last two decades. Indicators of current state characterize processes going on the area in recent years. Each part has its own integral estimation. Comparison of such estimations helps to find out the territories that need support and adequacy of development of certain areas. In turn, it gives opportunity to evaluate quality management for the territories.



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## Maritime Openness and Its Future Prospects in Iraq

*Mohanad HAMMAD, Ramond WOESSNER (France)*

Iraq has a single maritime port, 58 km in length on the Arab Gulf, through which it overlooks the world. This port is of great importance in Iraq's internal and external trade; it receives ships loaded with various types of commodities from many countries of the world, in addition to exporting oil by ships. The geographical location of Basra city, in southern Iraq, overlooking the Arab Gulf through Shatt Al-Arab, and its suitability for ship navigation have made it possible for different means of maritime and river transportation to pass through Iraqi territorial waters in the province. Means of transportation included local means as well as global maritime means of transportation such as ships, which enter Basra province waters - the only port linking Iraq to the external world in the southern region. Basra is Iraq's gate to the external world. It plays an important role in reinforcing the economy through facilitating trade and providing financial resources, as well as its effective contribution to creating job opportunities. Iraq's maritime port is situated in the area between the Mediterranean Sea and the Red Sea on one side and the Arab Gulf on the other side. This location has affected the activities of its ports and their importance, as they are situated in areas of conflict and rivalry, a matter which affected the port's geographical history as well. This geographical location provided a considerable flexibility due to the proximity to several neighboring countries (Kuwait – Iran – Saudi Arabia). Those countries have economic relations and ancient social bonds with Iraq, in addition to the fact that it's located near rich oil production areas in the south. Iraq ports have hugely and effectively contributed to stimulating the volume of commercial activities, including exports and imports; as Iraq hugely depends on maritime transportation in conducting trade activities with different countries of the world, especially ports and quays on the entrances of Shatt Al-Arab and its waterways. The research aims to discuss the state of Iraqi ports in the southern part of Basra province and study the related problems and obstacles. Moreover, it studies the future prospects of these ports with the aim of developing the transportation sector in Iraq, especially maritime transportation, in addition to drafting a future scenario for this important maritime port in Iraq, the Middle East, and the world.



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## Cluster and its spatial measurement

*Vladimir ILIN (Ukraine), N.E. NEFEDOVA, I. I. MECHNIKOV (Russian Federation)*

In the researches devoted to regional development and dynamics of economic space, a special place take "clustering" of spaces. The phenomenon of a cluster was for the first time studied by M. Porter in the 1980-s in the USA, and since then became object of researches worldwide. It is especially actual for countries with economies in transition which are in search of new forms of functioning and the spatial organization of economy on the way to the market relations. Relevance of further researches of clusters in the conditions of a competition aggravation in the world market is caused also by approach so-called "the sixth technological way" which is characterized by introduction of the latest technologies and emergence of new types of economic activity in world economy. The cluster is represented the most optimum form of functioning and the spatial organization of market economy which fully will be able to realize competitive advantages. Within this subject the task to consider topical issues on scope of cluster researches is set.



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## C12.30 Mediterranean Basin

**Humanity and Human Activities Under Changing Climatic Conditions in the Mediterranean**

**Chairperson(s):** *Maria PARADISO, Barbaros* GÖNENÇGİL

- Extreme Maximum And Minimum Temperature in Mediterranean Coasts in Turkey

  *Barbaros* GÖNENÇGIL, *Zahide ACAR DENIZ (Turkey)*

- Modélisation de la criticité des situations de basses eaux en région méditerranéenne - Application au bassin versant des Gardons

  *Ingrid CANOVAS, Philippe MARTIN, Sophie SAUVAGNARGUES (France)*

- Spatiotemporal trends and variability monthly air temperatures of Mediterranean and Aegean Sea Coastlines

  *Zahide ACAR DENIZ, Barbaros* GÖNENÇGİL (Turkey)

- G.C.C. and perceived quality of the tourist experience. A compared study case in a ligurian seaside resort and in Marrakech

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## C12.30 Mediterranean Basin IN COOPERATION WITH 7FP Marie Curie IRSES MEDCHANGe 612639

**Ethnicities, mobilities, changing relationships in the Mediterranean in a global reality 1**

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**Ethnicities, mobilities, changing relationships in the Mediterranean in a global reality 2**

**Chairperson(s):** *Maria PARADISO, Izhak SCHNELL*

- Ethnic Structure of the Republics of the former Yugoslavia: cultural diversity as a barrier for social



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stability and economic development

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**Humanity and Human Activities Under Changing Climatic Conditions in the Mediterranean**

- Surface Wind Speed Variability of the Western Anatolia the period of 1970-2012

  *Beyhan ÖZTÜRK, Zahide ACAR DENİZ (Turkey)*



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**Extreme Maximum And Minimum Temperature in Mediterranean Coasts in Turkey**

*Barbaros* GÖNENÇGIL, *Zahide ACAR DENIZ (Turkey)*

Extreme temperature events, affecting all living organisms, is a threatening phenomenon. In particular, because the Mediterranian basin is sensitive to climate change, the human activities in this area have a greater effect. In this study, we determined extreme maximum and minimum temperatures in both summer and winter seasons at the meteorological stations in the Mediterranean coastal areas of Turkey. In the study, the data of 16 meteorological stations for the daily maximum and minimum temperatures of the period from 1970-2010 were used. In addition, cold and heat waves have been investigated according to the WMO classification in this study. The records of the days obtained according to WMO classification were also investigated by comparing the days of hospital records, as well as, cold and heat waves effects on human health. The threshold values were calculated for each station to determine the temperatures that were above and below the seasonal norms in winter and summer. According to these thresholds, especially summer and winter extremes in recent years, a significant increase in the number of hot days has been observed. According to the Mann-Kendall correlation test, there have been more extreme hot days at the meteorological stations in the Turkish coast of the Mediterranean as opposed to the extreme cool days at minimum temperatures.



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# Modélisation de la criticité des situations de basses eaux en région méditerranéenne - Application au bassin versant des Gardons

*Ingrid CANOVAS, Philippe MARTIN, Sophie SAUVAGNARGUES (France)*

Les impacts attendus du changement climatique sur les ressources en eau soulèvent des interrogations. Des situations de tension entre ressources et besoins environnementaux et anthropiques (eau potable, irrigation, loisirs) devraient apparaître dans l'aire méditerranéenne. Comment se forme ce risque de tension sur la ressource selon les usages ? Comment évoluent ses composants ? Comment cette évolution peut-elle conduire à une situation critique ? Comment peut-on la mesurer et, donc, potentiellement, la gérer ? Une modélisation de la criticité des situations de basses eaux a été engagée aux plans chronologique et probabiliste. Le niveau de criticité a été défini comme un déséquilibre, à un moment et en un lieu donné, entre la mesure de la probabilité de la ressource disponible et la mesure des probabilités des demandes environnementales et sociétales. La combinaison de ces probabilités, en partie conditionnée par les forçages naturels et/ou anthropiques (migration, usage), doit permettre de traduire un état de tension et donc l'impossibilité de satisfaire un ou n besoins en eau selon diverses temporalités. L'étude a été menée sur certaines variables essentielles (modélisation statistique généralement gaussienne, parfois parétienne). Ensuite des indicateurs ont été élaborés et explicités dans des kindénogrammes analytiques afin de caractériser l'état, à un moment, de basses eaux au regard de la demande sociale et environnementale. Cette approche, qui intègre une dimension réflexive, est illustrée par des traitements opérés sur les précipitations, les débits et les prélèvements anthropiques, mesurées dans les bassins versants cévenols des Gardons de Mialet, d'Anduze, et d'Alès.



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# Spatiotemporal trends and variability monthly air temperatures of Mediterranean and Aegean Sea Coastlines

*Zahide ACAR DENIZ, Barbaros* GÖNENÇGİL (Turkey)

In this study, spatiotemporal trends and variability are investigated in monthly air temperatures in Mediterranean and Aegean Sea coastlines in Turkey. Climate variability effects have much in evidence especially over the temperature. With this study, trends and variability in the temperatures series are revealed in the Mediterranean and Aegean coasts stations, dominated by the Mediterranean climate, depending on the climate change. The trend analysis is applied monthly mean, minimum and maximum air temperatures observations from 36 meteorological stations over the Mediterranean Sea and Aegean Sea coastlines in the period of 1970-2010. Mean, minimum and maximum temperatures generally show upward trend during the summer and winter seasons. Significant warming trend is evident in all of the temperature series. Strong warming trend in the minimum temperature has an indicator of climate change effects during the summer season. In addition, the growing tourist population of these cities can be mentioned in the urban heat island.



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## G.C.C. and perceived quality of the tourist experience. A compared study case in a ligurian seaside resort and in Marrakech

*Mauro SPOTORNO (Italy)*

The relationships between Global Climatic Change (G.C.C.) and tourism can be studied according to three different perspectives. Following the first one, which is also the most widespread, the research focuses on the contribution of tourist activities to G.C.C., mainly as a consequence of the emissions of the gases that can increase the greenhouse effect. Following the second perspective the attention of the researcher is pointed towards the changes in the tourist offer determined by G.C.C. Finally, the third approach analyses how G.C.C. can affect the tourist demand as a consequence of the changes in the conditions of comfort perceived by the tourists. The aim of our survey, conducted within the project Medchange, 7^ framework programme, Irses Marie Curie, following A. Bigano (2006, 2007) A. Goria (2005) J.M. Hamilton, (2006, 2008, 2010) W. Lise (2002), R.S.J. Tol (2002, 2005) and others, is to contribute to understand how local climate changes can affect the quality of the tourist existential experience and so tourist flows. This implies to examine, first of all, how some motivational, social and cultural variables can attenuate or magnify the effects of the climatic conditions on the life experience of the tourists in different geographical, environmental, social and hosting contexts. To this purpose we have selected two sample areas one significantly different from the other from the geographical and tourist point of view but emblematic of possible changes: one in the Mediterranean northern area and one in Northern Africa. They are: Loano, a seaside resort in the western Ligurian riviera and the town of Marrakech, in Morocco. In each of these areas by means of a questionnaire submitted to a sample of tourists we have studied how given equal social conditions of tourists (age, gender, accomodation, origin .....), the correlation between the quality of their experience and the climatic conditions can change for: the different typologies of attractions and their fruition, the motivation of the trip and the expectations of the tourists in respect of the local weather conditions during their stay.



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## Israeli Arabs' segregation versus integration in global spaces

*Izhak SCHNELL (Israel)*

Arabs in Israel are performing their daily life in spaces that are globalized. Borders to Arab countries have been opened, teleand mass communication means are available on a global scope. The question to be asked is whether these new opportunities are used by Arabs in Israel in order to increase or decrease their level of ethno-national segregation. The study shows that Arabs in Israel open themselvs to the Arab world but this opening results in mixed effects on segregation. In Some ways Arabs segregate themselves in Arab spaces and milieus and in many other aspects they continue to see their main arena for activity in Jewish spaces.



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## European mobility to Morocco: Italians of Marrakesh

*Maria PARADISO (Italy)*

The presentation will discuss issues of integration, non integration, life realms of Italians living and working in Marrakesh, Morocco. The paper stems out from a fieldwork performed in the Italian community in the Moroccon city and it is a part of a broader research performed in several cities /different countries accross the Mediterranean Basin. Interviewed are Europeans in North Africa and North African persons in Europe.



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# Oil and Natural Gas Reserves, Energy Strategies and the Eastern Mediterranean: Ongoing Debates and the Regional Security

*Mutlu YILMAZ (Turkey)*

The two main hydrocarbon sources, oil and natural gas, have the largest portion of the energy market and the countries that take a part in the distribution and the production processes of these energy sources gain an additional strategic importance. In addition to well known reserves in the Middle-East and the Caucasus, newly discovered natural gas reserves in the Eastern Mediterranean enhanced geostrategic and geopolitical importance of the region and in this respect, it seems that the new reserves might deepen the ongoing political debates within the area. That countries such as Turkey, Syria, Lebanon, Israel, Egypt, Palestine and the Northern and the Southern Cyprus within the Eastern Mediterranean basin are in a state of conflict over the reserves makes the issue unsolved. At this point, the concepts of the continental shelf and the exclusive economic zone become important. Existing disputes between states in the region and the exclusive economic zones declared after the unilateral detection of natural gas reserves make the possible solution much more difficult. The exclusive economic zone declared by Southern Cyprus on behalf of the whole island without solving the ongoing disputes over the island is far from demands of Turkey to meet. However Southern Cyprus, Egypt, Lebanon and Israel have recently signed an agreement for the economic zone and accordingly started gas exploration and extracting operations with international companies while Turkey and the Northen Cyprus came to an agreement over the continental shelf delimitation and accelerated the counter oil and gas exploration in the region. These activities in the region whose legal status still unresolved, will further increase the tensions between Southern Cyprus and Turkey.



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# Ethnic Structure of the Republics of the former Yugoslavia: cultural diversity as a barrier for social stability and economic development

*Dmitrii MARTIANOV (Russian Federation)*

Today, the Western Balkans remain one of the most interesting regions by ethnic composition and at the same time one of the most stressful parts of Europe. In the articles devoted to this region, it is often called "powder keg" or "powder magazine", pointing to the unstable socio-economic and political situation and ethnic tensions. The breakup of the Socialist Federal Republic of Yugoslavia (SFRY) still remains one of the most complicated and understudied topic in present time. The split of multinational Yugoslavia formed six independent republics with its new state borders that were divided even more by the internal ethnic, linguistic and cultural dissimilarities. The different levels of economic development of the former Yugoslav republics contribute active migration, which leads to an increase in ethnic diversity of individual regions and cities in these countries. It is believed that the growth of the ethnic variety causes the fall in social stability and aggravation between different ethnic groups. At the same time, there is such a concept as "diversity capital" – the cultural and ethnic difference as a resource that, under certain circumstances, capable of self-growth and augmentation. The purpose of this report is to try to answer this question: Under what circumstances can ethnic and cultural differences have a beneficial influence on the positive growth of the Balkan Republics and be its favorable factor?



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**Steppe Conservation Or Rural Societies Development In The Arid Mediterranean Context? Case Of The Southern Tunisian Steppe**

*Ali HANAFI (Tunisia)*

Arid Mediterranean region of Tunisia has been characterized by the extension of steppes; perennial vegetation, with low land cover based on chamaephytes, grasses and halophytes. Ecosystems were therefore characterized by a fragile complementarily equilibrium between limited resources, territories and activities. However, and since the 1960s, the region has experienced significant socio-economic and environmental changes (land privatization of 33.800ha of collective pastures between 70 and 2005, private investment in agricultural development...) that affected this equilibrium and the steppe resources. In order to study this situation, we chose to work on two representative sites of the Tunisian arid region (Menzel Habib in the governorate of Gabes and Jeffara in the governorate of Medenine) between 1970 and 2005. We used a series of satellite images, topographic maps, and thematic maps. These documents were completed by two field surveys for which we have realized more than 500 vegetation notes and socio-economic field survey of about 600 households. The plain steppe lands were monopolized by immigrants who injected several investments into the agricultural development. Areas of rainfed agriculture were then increased by more than 600% during the period 1970-2005. This socio-economic mutation has conducted to a net degradation of steppe area (-12% in the same period) accompanied by a spatial steppe fragmentation, a deterioration of pastures quality and a floristic homogeneity. Thus, degradation of plant diversity could be a real threat of a possible return of desertification especially in the case of prolonged droughts. The superposition of the results of this agricultural pressure with land use systems showed that 58% of lands occupied by agriculture are fragile with low agricultural potentialities (stony or encrusted lands...). However, the agricultural pressure emanated from a legitimate aspiration of local people in economic and social development and has come under government policies that aimed to limit rural exodus. Moreover, appropriating lands and practicing agriculture are considered for immigrants as a "return to the homeland". However, their almost absence, accentuated by the rainfall irregularity has caused in many cases a further degradation of these sandy areas who lost their steppe vegetation allowing the wind to move the sand and we saw new wind accumulations. Some authors called this new form of desertification "The green desertification".



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**Strawberry pickers, precarious labour and Labour Geography: studying the agency of immigrant workers against informal working arrangements in Greece**

*Lila LEONTIDOU, Stelios GIALIS, Andrew HEROD (Greece)*

This paper studies workers' agency to confront informal employment patterns in Southern Europe. It focuses on the spatial aspects of a strike by immigrant agricultural workers engaged in the strawberry fields of Nea Manolada, in Greece's Peloponnesus region. Most of these immigrants are Bulgarians of a Roma origin, as well as Pakistanis and Bangladeshis, and they live in the fields in sheds made of tin, paper and nylon under inhuman conditions that resemble modern forms of slavery. Based upon this case, we analyse worker agency to confront coerced labour as a relational phenomenon, one strongly determined by the capital interests that workers had to confront and the economic specificities of the sector to which their firm belonged. We also explore the role of trans-local networks of solidarity. Issues of temporality and the timing of the struggle are also incorporated. A deeper understanding of such factors, it is argued, may contribute to strengthening the prospects of workers' struggle in places and spaces where painful capital devaluation diminishes workers' rights and dismantles employment relations. It also helps to develop a more nuanced understanding of workers' spatial agency.



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## Vers Une Analyse Des Resultats Des Elections Tunisiennes Avec Le Logiciel Hyperatlas

*Monaem NASR, Ali BENNASR (Tunisia)*

Le principe de l'application HyperAtlas est d'étudier la répartition d'un phénomène dans un maillage donné, comme toute carte choroplèthe. Trois options supplémentaires sont disponibles : étudier l'écart du phénomène par rapport à l'ensemble de la zone étudiée, étudier l'écart du phénomène par rapport un maillage intermédiaire et enfin mesurer l'écart par rapport aux voisins. Appliqué aux délégations tunisiennes, cet atlas permet par exemple, dans le cas des dernières élections tunisiennes, de repérer : - Quelles sont les délégations où un candidat présidentiel est supérieur à la moyenne nationale ; - Quelles sont les délégations où un candidat présidentiel est supérieur à la moyenne du gouvernorat ; - Quelles sont les délégations où un candidat présidentiel est supérieur à la moyenne de ses voisins immédiats ; Une carte de synthèse permet d'identifier les endroits où le phénomène est toujours sous ou sur-représenté. L'application de l'outil HyperAtlas aux élections tunisiennes de 2014 permet donc de comprendre les forces et les faiblesses de chacun des candidats dans une perspective multi scalaire. La notion de bastion électoral doit en effet comprise par référence à plusieurs niveaux géographiques. Un parti qui veut remporter les élections doit mener une stratégie à plusieurs échelles : nationale, régionale et locale.



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# Mediterranean belonging: between sea border and attachment. Views from Algiers post tertiary education students

*Mohamed ALOUAT (Algeria), Maria PARADISO (Italy)*

Defining a natural region is a rather complicated operation, but assessing the belonging to a region (if any) is an even more complex issue. We are interested to narratives by citizens and people who live in countries across the Mediterranean sea about their views on the Mediterranean and their emotional attachment to a Mediterranean space if any. Countries across the Mediterranean Basin combine different communities, are affected by increasing mobilities of different nature, vary in languages, religions, customs and traditions, and histories as well they share to some extent similarities. Encounters and circulations are also of various nature and happen at many scales and realms. The complexity and conglomerate of these determinants, but also regional and national politics, legacies as a post colonial sea, divides North-South and also within countries, geopolitical events contributed substantially to the formation of different images around the Mediterranean area, and sense of belonging to the region. Should the Mediterranean be considered nothing more than a natural compound, that derives its name from the ancient sea that separates the northern and southern shores contrasting socially, religiously and economically ? This paper examines a survey conducted in an Algerian university with students about their narratives on the Mediterranean space. Same survey has been made in Italian, Moroccon, Slovenian Universities. Here the case of Algiers students is presented.



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## Non-formal region borders: criteria of definition. Mediterranean case

*Tamara GALKINA (Russian Federation)*

The Mediterranean was formed historically as non-formal region with the uncertain borders. It has no state or administrative borders, but their definition is important for understanding the peculiarities of the region. The criteria of definition of the Mediterranean borders may be useful for the comprehension of the other non-formal regions. It is possible to form the following groups of criteria for the definition of the Mediterranean region and of the "Mediterraneity" idea: a) formally geographical or administrative b) natural or environmental, c) cultural, d) historical, e) economic, f ) geopolitical, g) political. The amount allocated 27 different criteria. The Mediterranean can be called "open" area. Its culture has absorbed the features of a culture of many peoples that settled the coastal part of the Mediterranean region and the coasts of the Black and Azov seas. Mediterranean culture in turn has a huge impact not only on neighboring territories, but sometimes to the whole world. Migration were and are currently one of the main links that connect disparate parts of the region together. A special role in the unification of the Mediterranean region and, in particular, the formation of the Pontic cultural world, linking cultural areas of the Mediterranean and Black-Azov seas belongs to the ancient Greek colonization. This paper examines also the historical role of rivers in Mediterranean-Black-Azov sea basin in the propagation of Mediterranean civilization. Repeated changes of cultural, political and economic leadership in the region has created a multi-layered culture. In General, the Mediterranean is a wide field for research from the point of view of different branches of science.



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# Socio-economic, technological and institutional drivers of European land use change, in long-term perspective: the case of Greece

*Theano S. TERKENLI (Greece)*

This paper constitutes a critical narrative of the role of socio-economic, technological and institutional drivers on the trajectory of land use change in Greece, in its Mediterranean context, over the past 200 years. Through qualitative analysis and synthesis of national experts' knowledge and insights into land regime patterns and factors, and supported by available quantitative statistics, this study aims to understand the reasons and ways through which land use change has historically been implemented and appropriated, leading to the present crisis-laden modern Greece. This research was undertaken as part of the VOLANTE FP7 Project (www.volante-project.eu), establishing seven land management regimes, on the basis of a comprehensive study of drivers of land use change in European lands, from 1800 to 2010. The recent history of land use change in Greece has been complex and turbulent, often externally influenced and fraught with particularities, stemming from its geographical specificities, as well as its socio-cultural, economic, technological, environmental and other characteristics. Phases of land use transformation, over the last two centuries, including major agrarian and land reforms, have overlapped or diverged significantly, according to external demands and the vagaries of Greece's political history, up to the present crisis situation. Viewed in comparative and critical perspective, the study's findings indicate the deficiencies and incompatibilities of land-use-related policy—with a long-standing top-down and sectoral orientation. The plethora of laws and directives relating to spatial and land use issues and rural development policy, coupled with frequent changes in governmental structures, forebode further difficulties in future crisis management.



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## Surface Wind Speed Variability of the Western Anatolia the period of 1970-2012

*Beyhan ÖZTÜRK, Zahide ACAR DENİZ (Turkey)*

The purpose of the present study is to analyze the wind speed in the Western Anatolia and to examine a trend analysis and analyze the possible spatial variability of in mean surface wind speed over the western Anatolia in the period of 1970- 2012. The trends of the annual and seasonal wind speed have been investigated for 60 meteorological stations which have been controlled by the homogeneity tested. We selected the 99th, 95th, 90th (1st, 5th, 10th) percentile value for each station as a threshold value to be definition of windy (calmy) days. The Mann-Kendall test is applied to identify statistically significant trends at each percentile values for the wind speed data. As well as this, trends in the extremely windy and calmy days are determined with Mann-Kendall rank correlation test. The results of this study have shown that there are marked spatiotemporal variations in the percentile values for the surface wind speed in the western part of Turkey. The time series showed negative trend in the almost all of the stations. The negative trend could be displayed by a decreasing the pressure gradient over the Aegean basin.



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# C12.31 Modeling Geographical Systems

## Big data Analytics and Spatial Decision Making

**Chairperson(s):** *Yee LEUNG, Manfred M FISHER*

- The Classification of Beijing Subway Station Based on IC Card Data

  *Bin MENG, Qin YIN, Liying ZHANG (China)*

- Interpretation of EO-1 Hyperion hyperspectral satellite images on the basis of ground spectroradiometry data

  *A.I.MIKHEEVA, O. C. TUTUBALINA, A. A. DERKACHEVA (Russian Federation)*

- Balance Methods in Export Potential of Latin America Agriculture

  *Karina PYRKINA (Russian Federation)*

## Modeling fluvial and hydrological processes

**Chairperson(s):** *Yee LEUNG, Manfred M FISHER*

- Multi-parameter method of lag time values calculating of surface runoff by the SAGA-GIS and their landscape interpretation

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- Catchments landscape features impact to the runoff and chemical composition of Zayachya river basin small rivers (southern part of the Arkhangelsk region)

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**Modeling Regional Growth and Technological Development**

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- Carbon emissions abatement under uncertainty

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- The frequency change of technosphere fires in Russia in the short term (according to the results of mathematical modeling)

  *T.V. VASHCHALOVA, V.N. KUDIN, V.A. SVETLOSANOV (Russian Federation)*

- Regions, technological interdependence and growth

  *Manfred FISCHER (Austria)*

- Linked OpenData for spatial monitoring

  *Therese STEENBERGHEN, Anuja DANGOL, Valerie DEWAELHEYNS, Olga ZALAMEA, Jos VAN ORSHOVEN (Belgium)*



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## The Classification of Beijing Subway Station Based on IC Card Data

Bin MENG, Qin YIN, Liying ZHANG (China)

Beijing has about 20 million populations and there is about 5 million passengers take the subway every day. The traffic flow is one of the key issues to understand the urban structure. Based on the usage of public transportation IC card, the clustering method on time series data was used to identify the different type of subway station in Beijing. We collected the IC Card data from March 1st to 20th .2013. The data include the time, the subway station of the start and end of the trip. Every trip can be identified by the IC Card number. We calculated Kurtosis, Skewness and other characteristics and tried different Cluster analysis methods. The 195 subway stations are divided into 8 different clusters by comparing the results. These clusters have different pattern of the traffic flow on temporal scale. Some clusters show that the stations are at the center of jobs and the others are at the center of homes. And there are also some clusters located at the shopping center. We found that the spatial-temporal differences of traffic flow are the expression of the spatial pattern of urban functions in Beijing. The public transportation IC card data are not only the record of the traffic but also the clue of the usage of space in a city. The study on the IC card data is helpful to understand the urban space characteristics better. Key Words: IC Card Data, Clustering Method on Time Series, Urban Space Structure, Beijing



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## Interpretation of EO-1 Hyperion hyperspectral satellite images on the basis of ground spectroradiometry data

A.I.MIKHEEVA, O. C. TUTUBALINA, A. A. DERKACHEVA (Russian Federation)

At the present time, in connection with the launch of a number of hyperspectral imaging systems and increase in the active use of the data, analysis of the resulting imagery is developing, and it requires ground-based libraries of spectral characteristics. To ensure comparability of terrestrial and satellite sources of information, it is necessary to carry out atmospheric correction of the obtained images. We have atmospherically corrected an EO-1 Hyperion image for the center of the Kola Peninsula using the Empirical Line, which effects a linear regression between ground and at-satellite data, using reference sites. Using the field data of 2014 we have demonstrated that a quality geographical result is possible even for the complex spatial structure of the forest-wetland landscapes with mixed spectral signatures. After the atmospheric correction we performed satellite image interpretation using subpixel classification methods and on ground data. This study is supported by RFBR, grant 13-05-12061 офи-м and by the Spectral Library of Arctic Plants (SLAP) project of the INTERACT programme.



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## Balance Methods in Export Potential of Latin America Agriculture

Karina PYRKINA (Russian Federation)

Latin American is one of the largest producers and exporters of agricultural products. Some experts consider that this region can feed the whole world with its meat, soybean, corn, coffee, sugar and bananas. But there is a serious problem inside the region: about 12% of people are living in hunger and poverty, and it's a big deal – to sell or to feed? One of the ways to answer this question is a usage of the balance method by analysis and mathematic matching of food production and supply, export and import operations, land and fertilizers use, workforce data. The results of balance methods present a comprehensive picture the pattern of a country's and whole region's supply. Not all the Latin America countries are succeeded in keeping this balance. In conditions of world increasing population and food demand this region should improve productivity and yield of its land and install the regulated prices for some products in the domestic market and remove restrictions on exports abroad in accordance with world market prices.



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# Multi-parameter method of lag time values calculating of surface runoff by the SAGA-GIS and their landscape interpretation

Aleksander EROFEEV (Russian Federation)

The paper presents a multi-parameter dynamic-stochastic method of calculating the rates lag time runoff, taking into account the parameters of landscape heterogeneities of small river basins territories of Western Siberia south (microrelief, the intensity of infiltration, the influence of vegetation and others). The method is based on a modified Manning's equation and implemented in the module Isochrones Variable Speed SAGA-GIS. However, the software allows you to perform a timing lag only in relation to one element of the drainage network (permanent or temporary water flow on the DEM). To construct GRID-model on the surface of the whole river basin has been developed method of "cascades" - a matrix of values consisting of a set of elementary forecasts lag time located around the perimeter of the main channel and overlapped on each other. After, a map of lag time intervals forecast were built for each river basins: up to 1 hour; 1-3 hours; 3-5 hours; 5-10 hours; 10-15 hours. Performed numerical simulation of lag time values at different parameters (Rainfall Intensity (at 0; 0.08; 0.66; 2.11; 10 mm\hour, the surface roughness index (Manning's Number) (0.03 to 0.12), the amount of infiltration (Curve Number) (from 30 to 90) and other variables of the mathematical model) showed that the greatest impact on the final results has parameter of rainfall intensity (mm\h). Then the landscape interpretation of obtained rates was performed into landscape units of study area. The reported study was supported by RFBR, research project No. № 14-05-31121 мол_а."



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**Assessing the role of glacier and permafrost on hydrology using water balance modeling**

Matvey DEBOLSKIY, Anna LILJEDAHL, Regine HOCK, Jing ZHANG, Vladimir ROMANOVSKY, Ronald DAANEN (United States of America)

Recent observations of melting glaciers and thawing permafrost are impacting cold region hydrology through complex processes. Rarely are permafrost and glaciers studied as part of a coupled hydrologic system, which represents large areas in North America and Eurasia. Serving as a proxy watershed for permafrost and glacier affected basins, our field and modeling study at the Jarvis Creek watershed (~600 km2), Interior Alaska, aims to assess the importance of glacier wastage and permafrost on lowland hydrology. The major objectives are a) to assess the hydrologic pathways of glacier wastage within a watershed underlain by discontinuous permafrost; b) to quantify the effect of glaciers and permafrost on watershed-scale hydrologic fluxes (runoff, aquifer recharge) and storage; c) to project the future hydrologic regime using custom-designed downscaled climate projections with a special emphasis on potential changes in streamflow and wetland distribution. We are using the physically-based Water balance Simulation Model, WaSiM, to refine our understanding of physical processes regulating the watershed-scale hydrology. Here, we are especially interested in the modules of heat transfer, snow cover and glacial hydrology, which are crucial for effectively modeling cold region water budgets. We are forcing the model using historical observations along with field measurements and climate projections. Field measurements of glacier melt, runoff, groundwater levels, snow accumulation and geochemical signatures will support model calibration and validation. An increase in the amount of melt water from glaciers may increase streamflow and aquifer recharge, and ultimately, amplify permafrost thawing. Conversely, a reduction in permafrost extent may subsequently affect short- and long term watershed response to rainfall and glacier melt. The recent and projected climate warming is affecting permafrost and glaciers and our study aims to provide increased understanding of how rivers may respond. Ultimately, the findings regarding the controlling processes and underlying mechanisms may be applied to similar regions elsewhere.

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# Modelling the effect of land-use/cover changes at sub-catchments on downstream flood peaks at the catchment outlet

Joy SANYAL (India)

This study aims to explore how varying degrees of land-use/cover (LULC) changes in sub-catchments affects a flood peak at the catchment outlet. The Konar catchment, a part of the upper Damodar Basin in eastern India has been taken as the study area. The rainfall-runoff processes for two LULC scenarios, three decades apart, have been simulated using the HEC-HMS model. Because of the limited data availability at the study site, the Natural Resource Conservation Service (NRCS) Curve Number (CN) approach has been used to account for the effect of LULC and soil on the hydrological response of the catchment. Sub-catchment wise LULC changes and variation in the flood peaks at the basin outlet exhibited a weak ($r = 0.53$) but statistically significant positive linear correlation. But a number of sub-catchments showed marked deviations from this relationship. Model outputs show that the varying timing of flow convergence at different stream orders due to localised LULC changes makes it difficult to upscale the conventional land use and runoff relationship, evident at the plot scale, to a large basin. However, a simple modelling framework is provided based on easily accessible input data and a freely available and widely used hydrological model (HEC-HMS) to check the possible effect of LULC changes at a particular sub-catchment on the hydrograph at the basin outlet.



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## Long-term average annual flow of Northern Caucasus rivers along the Russian Black Sea coast

Maria KOLESNIKOVA, Alexey KOSITSKIY (Russian Federation)

Kolesnikova M. S., Kositskiy A. G. Long-term average annual flow of Northern Caucasus rivers along the Russian Black Sea coast The area of Northern Caucasus Russian Black Sea coastal line takes more than 300 km from North-West (Taman peninsula) to South-East (River Psou). Geographical conditions of the territory vary a lot and represent the transition zone form steppe zone of Variable Zone to Subtropical Climate zone. Moreover, vertical zonation of landscapes is highly represented. To study the conditions of the river flow formation long-term average annual data for all gauging stations of the research territory rivers were obtained. Out of all of them there were chosen 18 stations with the period of observation starting from 20 years. The relation between the long-term average annual depth of runoff and the average altitude of the catchment area H was estimated. By using the relation achieved the depth of runoff was deduced to the altitude of 500 meters (H = 500 m). These data were mapped. On the map it's visible that the runoff is increasing following from North to South along the coastal line. Long-term average annual discharges show tight relation with stream order. Despite the variety of geographical conditions the relation is homogeneous for the research area. To determine the accuracy of the different techniques of long-term average annual outfield rivers' discharges estimating, the evaluation of this characteristic for River Mzimta ignoring the data of its basin's gauging stations was held. The result shows that all the data estimated by using the evaluation of relation between the long-term average annual discharge and stream order demonstrates the most accurate results in comparison with the traditional techniques.



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## Catchments landscape features impact to the runoff and chemical composition of Zayachya river basin small rivers (southern part of the Arkhangelsk region)

Alexey KOSITSKIY, Danila SHKOLNYI, Anna LUKYANOVA (Russian Federation)

Catchments of the small rivers are usually stated in one hydrological zone, but regime of each river can differ from zonal regime under the local landscape factors. Two neighbor rivers can have different flow rate values and chemical composition of the water because of landscape differences between their watersheds. To determine the effect of landscape factors authors have done a hydrological and hydrochemical survey on Zayachya river watershed (tributary of the Kokshenga river, Northern Dvina basin) in the southern part of the Arkhangelsk region. At the study area Zayachya river has 8 tributaries with various landscape features on their catchments. Study area was surveyed in field trips, which are held since 2013 during all phases of water regime. Collected material to date allows to evaluate features of rivers runoff and chemical composition for low-water period, which is good for comparison of rivers because of homogeneity of runoff formation. Low-water periods flow rate of different Zayachyariver tributaries may differ by more than ten times. Mineralization of each river may also differ by several times. Main ions in chemical composition are $HCO_3$ , Ca2+and Mg2+. The highest water mineralization corresponds to the rivers with catchments under the plowing.



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## Carbon emissions abatement under uncertainty

Yee LEUNG (China)

The increasing concentration of CO2 in the atmosphere comes largely from anthropogenic emissions which have exerted a significant impact on global warming. Thus, reducing carbon emissions has become an imminent task for all countries. Among all measures to reduce carbon emissions, setting targets and levying carbon tax appear to be effective means to achieve the abatement caps. However, uncertainty in data, objectives and constraints often create problems in the optimization process and lead to uncertainty in the analysis results. This paper employs statistical and fuzzy sets methods to incorporate uncertainty into the optimization framework and to propagate uncertainty to the optimal solution so that the level of uncertainty in carbon emission abatement can be calibrated. Within the framework, uncertainty of coefficients and parameters will be represented by fuzzy or interval numbers and uncertainty in objectives and constraints will be represented by elastic functions. The optimal results will then be represented in fuzzy intervals. The conceptual arguments will be substantiated by a real-life case study.



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# The frequency change of technosphere fires in Russia in the short term (according to the results of mathematical modeling)

T.V. VASHCHALOVA, V.N. KUDIN, V.A. SVETLOSANOV (Russian Federation)

Technosphere fires is one of the most significant threats to sustainable socio-economic development of the country. Their annual incidence exceeds 100 thousand cases, and the damage is tens of billions of rubles. Correlation analysis of long - term statistical series of the frequency of fires and number of climatic, socio-economic and demographic characteristics of the regions of Russia has allowed to detail the most significant. The most important of these is the number of population of the region. Among others, the duration and severity of the cold period, the level of general and teenager crime, the proportion of the number of population living in institutions for the elderly, the ratio of per capita incomes with subsistence minimum, the coefficient of the migration growth/decline of the number of population, the level of unemployment and others. Author's mathematical model, built on the base of twenty-year time series of statistical data makes possible to construct a baseline scenario of the change the frequency of technospheric fires of the Russian Federation regions using as the main variable the changes of the number of population of the region in time. The analysis of the impact of the above-mentioned additional characteristics of the number of the region population to the frequency technospheric fires is made.



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IGU 2015 – 0652

## Regions, technological interdependence and growth

Manfred FISCHER (Austria)

Why have some regions grown rich while others have remained poor? This is a recurrent question in the literature on economic growth. Economic growth theorists have emphasized the role of externalities in the accumulation of factors of production in explaining growth (Romer 1986, Grossman and Helpman 1991), but typically assume that knowledge spill overs to other agents within the region, but not to other regions, and hence ignore the impact of location and neighbourhood in explaining growth. This paper presents a theoretical growth model that explicitly takes into account technological interdependence among regional economies in a Mankiw-Romer-Weil world (Fischer 2014). Technological interdependence is assumed to operate through physical and human externalities. The magnitude of the physical and human capital externalities at steady state is estimated using the reduced form of this theoretical model and its associated empirical model along with data for a system of 198 regions across 22 European countries. The results reveal that technological interdependence among regions works through physical rather than human capital externalities across regional borders.



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IGU 2015 – 2257

## Linked OpenData for spatial monitoring

Therese STEENBERGHEN, Anuja DANGOL, Valerie DEWAELHEYNS, Olga ZALAMEA, Jos VAN ORSHOVEN (Belgium)

Geospatial Monitoring systems have specific data modelling requirements. The paper focuses on semantic modelling issues encountered while implementing Linked Open Data (LOD) principles in a regional spatial monitor of Flanders, Belgium. The evolution of the spatial monitoring system is from Spatial Data Infrastructures (SDIs) towards the adoption of semantic web technologies. The LOD started with a Data Catalog Vocabulary (DCAT) for description of geospatial indicators, including additional information on the related policy assessments, spatial characteristics, the provenance, and the measurement variables and dimensions of indicators. The next step consisted of incorporating geospatial querying capabilities by publishing the geospatial indicators as Linked Open Data using GeoSPARQL and the RDF/OWL Data Cube vocabulary. The study presents the potential and challenges of linking existing geospatial indicators with other Open Data sources as LOD. A specific case study presents how new insights for spatial planning and decision making can be gained from linking geospatial indicators of various apparently unrelated monitoring systems. Two main challenges are discussed: the multi-level dimension of monitoring systems and the data transiency. The linked geo-data include indicators of demography, housing, traffic safety, cycling infrastructure, and ecosystem services. These are spatiotemporal phenomena with different dynamics and scales, stored in monitoring systems for various purposes, with their own different geographic -and time frames.



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# C12.32 Mountain Response to Global Change

## Mountain regions in context of Global Change; adaptation, new approaches and role of science 1

**Chairperson(s):** *Yuri BADENKOV*

- Altai-Sayan Transboundary Mountain mega-corridor: reconciling natural and cultural heritage with sustainable development goals

  *Yuri BADENKOV (Russian Federation)*

- Perception and adaptability of the population in the Ecuadorian Andes to the climatic variability. Multicultural comparative analysis

  *Svetlana ZAVGORODNIAYA, Anna COSTALES, Sofía ENRÍQUEZ (Ecuador)*

- The research-action interface in sustainable land management in Kyrgyzstan and Tajikistan: challenges and recommendations

  *Bettina WOLFGRAMM, Jyldyz SHIGAEVA, Chad DEAR (Switzerland)*

- Integrating science-based, participatory, and transboundary landscape approaches for adaptation and sustainable development within the Asian Highlands

  *Robert ZOMER, Jianchu XU (China)*

- Environmental management's clusters in Dagestan

  *Eldar ELDAROV, Magomedkamil GADZHIYEV, Shahmardan MUDUEV (Russian Federation)*

## Mountain regions in context of Global Change; adaptation, new approaches and role of science 2

**Chairperson(s):** *Yuri BADENKOV*

- Improving local Governance of Ecosystem Services through Virtual Observatories in Naryn, Kyrgyzstan

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- Socio-economic assessment of the conditions for development of mountain regions

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- The North Caucasus: tourism versus agriculture and traditions of the people

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- Monitoring lichen communities in montane regions under climate change stress

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**Mountain regions in context of Global Change; adaptation, new approaches and role of science 3**

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- The Russian Altai landscapes: investigation and inventory for sustainable mountain development
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- Impact of Climate Change on Livelihood Options in Kullu Valley of Himachal Pradesh, India
  *Inder Jeet SINGH (India)*
- Mountain Climate Changes in Taiwan and its Implications
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- Peculiarities of the structure formation for mountainous catchments
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- Ecological-geographical researches of intermountain depressions of Altai
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- Lowland-foothill landscapes of the North-Eastern Caucasus as mountain-plain geographical ecotone
  *Zagir V. ATAYEV (Russian Federation)*



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# Altai-Sayan Transboundary Mountain mega-corridor: reconciling natural and cultural heritage with sustainable development goals

Yuri BADENKOV (Russian Federation)

Large-scale transboundary connectivity conservation and its effective management are the main priorities for the conservation of the Altai-Sayan landscape and ethno-cultural values during a time of Global Change. New research approaches based on transdiciplinarity principles are needed for translating research findings in practice of effective management and development taken into account regional context.



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**Perception and adaptability of the population in the Ecuadorian Andes to the climatic variability. Multicultural comparative analysis**

*Svetlana ZAVGORODNIAYA, Anna COSTALES, Sofía ENRÍQUEZ (Ecuador)*

Multidisciplinary and transdisciplinary principles are applied to understand and interpret the perception and adaptability of the high Andes population to the climatic variability. The study focuses on several communities of three ethno-cultural groups in Ecuador: Puruháes, Kayambis and Otavalos, linked to two geographic scenarios. Information is collected and the climatic variability is discussed in the past 30 years, the dynamics of land use and natural vegetation cover in recent decades is interpreted and the data of real average compared with information obtained in conversations, conducting surveys and psychological test (behavior and adaptability analysis). According to the obtained data, it is inferred that the population involved in the study perceive the climatic variability and its impact on productive activities. In the study, the prospect of adaptability is related to emotional and personal characteristics of resilience of a person or group. The ability to interact with the environment to maximize their needs, is a process through which communities assimilate new ways of survival and, therefore, adapt to new situations. Studying these characteristics in a particular ethno cultural group can model the adaptation potential of the inhabitants of these groups in situations of threat and its potential vulnerability. The generation of a geographical database allows to concatenate all the information raised, providing many advantages for data management to support the analysis and mapping and cartographic representations that reflect the processes analyzed. The results of this research are very valuable specially for program development aid and intervention in times of crisis, especially at group level.

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## The research-action interface in sustainable land management in Kyrgyzstan and Tajikistan: challenges and recommendations

Bettina WOLFGRAMM, Jyldyz SHIGAEVA, Chad DEAR (Switzerland)

International agencies and programs introduced sustainable land management (SLM) to Central Asia after the former Soviet Republics became independent in 1991. An aim of early SLM initiatives was to address challenges linked to the transformation of the agricultural sector from a centrally planned to a decentralized market economy. This article analyses the knowledge-action interface in Kyrgyzstan and Tajikistan as it relates to SLM. Analysis focuses on the influence of underlying land management concepts by means of a literature review. Contemporary barriers at the research-action interface were identified using participatory appraisal. And a historically contextualized understanding of the effectiveness of interactions between researchers, policy makers and practitioners is based on an analysis of purposefully selected cases. The study concludes that knowledge of different stakeholder groups is often highly disconnected. Inter- and transdisciplinary studies are rare, and academic research on SLM has subsequently been ineffective at contributing to substantial benefits for society. Further, researchers, policymakers, and practitioners in this context must recognize the differences between SLM and what is often referred to as the equivalent Soviet-era concept—Rational Use of Land Resources (RULR)—and the resulting implications of these differences. The authors recommend the following: creating an enabling environment for SLM research through academic institutional reform removing structural constraints; making research outcomes more effective by applying systems approaches that produce evidence for policy makers on the multiple benefits of SLM; helping land users evaluate SLM strategies; and investing in the establishment and maintenance of a multi-stakeholder SLM platform that allows dynamic exchange.



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**Integrating science-based, participatory, and transboundary landscape approaches for adaptation and sustainable development within the Asian Highlands**

Robert ZOMER, Jianchu XU (China)

Recent results and application of integrated, interdisciplinary multi-year research applied in case studies in Nepal, China, and Pakistan present options for integration of state of the art, operationally useful climate modeling results within transboundary landscape and community development efforts in the "Asian Highlands". This vast mountainous area including the Himalaya, Hindu-Kush, and Tibetan Plateau, is the source of most of the major rivers of Asia and directly and indirectly sustains more than 2 billion downstream dwellers. The region has been warming at greater than global average rates and ongoing climatic changes are projected to have major impacts on terrestrial ecosystems, biodiversity and hydrologic cycles, and on mountain farmers, pastoralists, and communities. Mountain farming and pastoral systems, like mountain biodiversity, are finely adapted to narrow environmental and bioclimatic niches. Although farmers and indigenous communities have coping mechanisms viable within certain limits of variability, a better understanding of the direction of expected climate change, and the nature and magnitude of these impacts, is essential for adaptation and effective conservation planning, and sustainable development of these highly fragile mountainous regions. State of the art climate modeling is integrated with multi-scale and multi-sectoral vulnerability analysis for supporting development, planning and implementation of adaptation strategies, and enhancing the resilience of local communities and socio-ecological systems. Sophisticated climate modeling is provided in specifically tailored products useful at the local to regional level. A feedback and interactive communication pathway for two-way knowledge exchange provides improved local and regional knowledge for better, more effective, and more equitable adaptation strategies and regional planning.



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## Environmental management's clusters in Dagestan

Eldar ELDAROV, Magomedkamil GADZHIYEV, Shahmardan MUDUEV (Russian Federation)

Contemporary economy of Dagestan is specialized on the production of raw materials. Highly efficient manufacturing is not well developed which results in low average income and quality of life. For already many decades the balance of migrations remains stably negative. Therefore, one of the most important strategic tasks of Dagestan's economic development is the creation of a favorable business climate contributing to the growth of the branches producing end products with high value added and thus to the increase of the level of life. Such projects, programmes and plans should start with a study of features and patterns of market environmental management considering the socio-economic and environmental specifics of the region. It includes a study of local and regional clusters of environmental management, i.e. groups of geographically close and interconnected enterprises (firms, companies) specialized in the use of mineral and other natural resources and having similar territorial interests. Clusters have a flexible specialization and are focused on the production of exclusive goods and services, and cooperation between their elements. As a rule, they initiate innovations and modernization, and contribute to social stability in a region. Contemporary strategic approaches to economic regionalization of Dagestan are based on its division into four parts – the northern, the central, the mountainous and the southern ones. The most perspective environmental management's clusters in each economic zone of the republic are the following. Northern Dagestan: the agro-industrial cluster, production and chemical processing of oil and gas, processing of fish and other sea resources, the use of hydrological, thermal and biological resources, tourism and leisure, and territorial logistics. Central Dagestan: the agro-industrial cluster, production and chemical processing of oil and gas, production of construction materials, tourism and leisure, territorial logistics (including sea transport and aviation). Mountainous Dagestan: mining, production of hydro-energy and chemicals, the agro-industrial and the agro-logistics clusters, tourism and leisure. Southern Dagestan: production of hydro-energy and chemicals, production of construction materials, the agro-logistics cluster, processing of fish and other sea resources, tourism and leisure and territorial logistics.



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## Improving local Governance of Ecosystem Services through Virtual Observatories in Naryn, Kyrgyzstan

Zuura MAMADALIEVA, Aiganysh ISAEVA, Christian HERGARTEN, Marc FOGGIN (Kyrgyzstan)

Mountain Environmental Virtual Observatories (M-EVO–ESPA) project. The research blends cutting-edge concepts of adaptive governance with citizen science and knowledge co-generation to break the vicious cycle of limited and poor quality environmental data in remote mountain areas. The research is focused on Naryn district, located in the Tien-Shan mountain range in Kyrgyzstan. Local ecosystems are characterized by high mountains surrounded by arid regions. Since ancient times Kyrgyz people are engaged in livestock breeding on distant pastures relying on diversity of these ecosystem services. During the soviet era, natural resources like pastures and water were centrally managed in accordance with top-down production plans. After the collapse of the Soviet Union, this governance structure largely collapsed, and only recently a decentralization process was initiated, empowering local communities to engage in resource governance. To do so, reliable environmental information is needed, which contrasts with the data scarcity left after the collapse of the previous system. In the M-EVO project, a variety of methods was applied for data collection and detailed problem identification, i.e. observation, interviews, focus–groups and analysis of the official documentation from state bodies. The analysis revealed low capacity of adaptive governance and a strong dependency of local communities on external information, initially provided by state experts. Based on these findings, the project will focus on improving the adaptive capacity of the communities and initiate participatory monitoring of several environmental variables describing climate, vegetation and wildlife.



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## Socio-economic assessment of the conditions for development of mountain regions

M.D. GORYACHKO, V.L. BABURIN, A.I. DANSHIN, P.L. KIRILLOV (Russian Federation)

The report proposes a methodology for estimating the additional costs for the population and the economy in mountain regions. This involves an assessment of loss of business, households and budgets at all levels as a result of the narrowed specialization mining economy, additional costs and low productivity, high business risks and living of the population. For effective management of mountain areas it is necessary to understand how the socio-economic development parameters related to the specific mountain areas. The relatively low level of development and low permeability for all types of communication is a common characteristic of mountain regions. This causes the specific dispersed type of settlement, and lower population density. The population density decreases with increasing altitude region and is usually reduced to zero above 1800 m. At the same time, foothill zone and the bottoms of the valleys are the areas of highest concentration of population and economic activity. This increases competition for resources and human-induced pressures on the environment. The research was conducted in all mountain regions of the Russian Federation, the results of which was defined population and the potential of local economies in mountain areas. Typology of Russian regions by factors of influence of mining conditions on the socio-economic development conducted. Assessment of the impact of mining conditions on the socio-economic development in more detail carried out on the example of the Altai Republic. Highlands occupy the greater part of the territory of the country (more than 65% of the territory), another 27% are mountain areas and only about 7% of the area - a mountain foothill areas.



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## The North Caucasus: tourism versus agriculture and traditions of the people

Raisa GRACHEVA (Russian Federation)

In recreational development strategies of the North Caucasus interest of mountain population in the tourism as a source of income is not considered. Nevertheless there is a clear heterogeneity of the population involvement in the recreational trend. Excluding the West Caucasus with developed resort industry and such "insular" recreational centers as Elbrus area (Kabardino-Balkaria), Teberda – Dombay (Karachaaevo-Chercessia), and mountains of the North Ossetia that can be called a "regional weekend home", in other regions recreational activities is negligible, local population is not involved in tourist business and tourist infrastructure is not developed. Agriculture, livestock especially, being a system forming sector, determines to a large extent the regional economy, income of the number of people, and solves employment problem. Rural population shows increasing interest in traditions dictated by customary law and Sharia and the revival of Jamaat as a community lifestyle. Such processes contribute to spiritual stability of community but at the same time prevent the development of tourism. The obstacles are also the absence of the skills in tourist business, perception of tourists as "alien people" and the loss of environment-oriented skills. The essential limiting factor is that border areas, formerly attractive for tourists are closed for entry. The East Caucasus has extremely rich natural and cultural-historical potential for tourism development and there is a great interest of authorities in tourism development. Community outreach programs are the necessary steps to achieve balance between population traditions and tourism and to find the most convenient kinds of tourism activity in the North Caucasus.



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## Monitoring lichen communities in montane regions under climate change stress

Gregory INSAROV, Evgeny DAVYDOV (Russian Federation)

Observed and projected climate change and its effect on terrestrial ecosystems in mountains are greater than global mean values (IPCC, 2007, 2014). Lichen communities are efficiently used for biological monitoring of air quality over decades. Since the end of the XX century, lichens are used to monitor biota alteration under climate change stress. We studied LC in Altai Mountains, Russia and Kazakhstan. Average warming in this region was as high as 2.8 C over last 50 years. Study is conducted in Mountain Protected Areas (MPA) where management activity is restricted,i.e. influence of other than climate change factors is minimal. Epilithic lichens were sampled on standardized plots along altitudinal gradient 500 to 3000 m ASL. Distribution of lichen species along altitudinal gradient revealed three groups of species: (1) species met at all the elevations, (2) species inhabiting lower-mountain belt below 2400 m ASL, and (3) species inhabiting just high-mountain belt over 2300 m ASL. Because changes in montane species distribution consistent with a response to warming is upward in elevation, species of the third group are pushed off the top of Altai mountains by rising temperature. They are likely to be at increasingly high risk of extinction in the face of increasing global warming.



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## The Russian Altai landscapes: investigation and inventory for sustainable mountain development

Dmitry CHERNYKH (Russian Federation)

The Russian Altai is the territory of natural contrasts. It is practically the north of Inner Asia in "miniature". The author's research results obtained on the Russian Altai can be used for different purposes and at different levels. Worthy of mention are some major outcomes. For instance, the author proposed a positional analysis to determine a key factor or a number of factors that separate Altai as the regional geosystem and give its difference from the adjacent ones. The landscape map of the Russian Altai (1: 500000) covering 5315 patches was developed. A total of 266 species of landscape are distinguished in the Russian Altai. For the physical-geographical provinces of the Russian Altai, the quantitative assessment of complexity and landscape diversity was made using the landscape metrics. A large-scale landscape mapping was performed for functional zoning of some parts of the Russian Altai (administrative units, protected areas). The general goal of functional zoning is a combination of nature protection (including preservation of a biological and landscape variety, maintenance of ecological stability and safety) with recreation and other types of land use. The author developed the approach to defining subregional nature-management systems in the mountain area. Nature-management systems are interpreted as prerequisites and limitations in various types of usage. All in all, forty subregional nature-management systems were defined within the territory of the Russian Altai. Finally, it was found that dynamics of glaciation in the Late Holocene on the background of minor short-period fluctuations of meteorological parameters was largely determined by the position-geographical features, and self-development of glacialnival and the adjacent geosystems.



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# Impact of Climate Change on Livelihood Options in Kullu Valley of Himachal Pradesh, India

Inder Jeet SINGH (India)

Dictionaries, in simple terms, define livelihoods as 'a means to a living' or 'the way you earn money in order to live'. It means to say that it is the sum of ways in which people make their living, which clearly makes it more than merely synonymous with income, because it directs attention to the way in which a living is obtained, not just the net results in terms of income received or consumption attained. Horticulture is an important tangible resource which is playing an important role in livelihood security and economic growth for rural people in Himachal Pradesh. Among horticulture crops apple is the dominant fruit grown in the state. The state has a comparative advantage in the cultivation of apple and other temperate fruits. Kullu Valley which has been undertaken for the present study has experienced increase in temperature due to which apple producing areas of Kullu are shifting towards higher reaches of the mountains. Kullu in Himachal Pradesh was once known for best quality apple in the country but now apple have become uneconomical, nonviable, less profitable and even unproductive in such a short period. The present study examines the impact of climate change on the livelihood of rural people in the study area based on climate information, farmer's perceptions and field work. The study is based on primary as well as secondary data. Secondary data regarding apple area and production has been collected from department of horticulture, Shimla. Two villages Bajaura and Nushala in Kullu valley have been selected for field work. Bajaura is situated in the extreme South of the valley and Nushala in the extreme North. These two villages are experiencing the impact of climate change in Negative and positive way respectively. Bajaura which is situated in the South of valley is experiencing decrease in apple area and farmers of this village replacing their livelihood from apple orchard to vegetable crops while Village Nushala which is located in the extreme North of the valley is experiencing increase in apple area and production due to which farmers are shifting their livelihood from vegetables to apple cultivation. Local perception of the climate variables to apple production were noticed from 15 farmers from each village to know farmers perceptions regarding climate change and its impact on their livelihood. Perceptions were made on basis of gathering data of two periods (1990 and 2010 years) of snowfall, temperature and rainfall. In Kullu valley area under apple has shown increasing trend since 1990-91. During 1990-91 area under apple was 14342 hectares which increased to 21824 hectares in 2006-07 but the productivity of apple has gone down very fast. It was about 5 tones/ hectares during 1990-91 which reduced to 2 tones/ hectares in 2006-07. During the analysis of climate data for previous 20 years It is observed that temperature has showed increasing trends whereas precipitation showed decreasing trends in the study area.



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## Mountain Climate Changes in Taiwan and its Implications

Hung-Fei LEI (China)

Based upon the daily weather records of 25 main weather stations and of more than 200 automatic weather stations in Taiwan, this study aims to demonstrate firstly the characteristics of mountain climate in Taiwan and its probability shift due to climate change. It then addresses, by using a special case from the context of geomorphic systems and landscape ecosystem in Lanyang River Basin, the impact of this shift on vegetation cover, sediment transport, and the interaction between them. The characteristics of mountain climate and its shift are realized through both physical interpretation and the practice of spatial statistics through ArcGIS. The implication of the climate change for landscape ecosystem is discussed with the altitutional distribution of vegetation cover. The result suggests that a greater impact would take place at two locations: the elevation of 500~700 meter and around 2000 meters above sea level.



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**Peculiarities of the structure formation for mountainous catchments**

Tatiana TRIFONOVA, Sergey ARAKELIAN (Russian Federation)

The principal question which has to be answered, is the mechanism of formation of such a natural object as catchment being the key structure for whole geo-system. There is no doubt that permanent and temporary water channels as well as ancient ones (both on surface and in underground) play a leading role in development of dynamic processes on the Earth surface and in Earth crust due to existence of unified 3D-cracknet for a river basin. We have chosen the river basin in a mountain massif as an object under consideration; firstly, the unit is not covered with mellow deposits as a rule. Secondly, localization of slope surface allows us to observe the universal phenomena within a compact dislocation area but in comparison with quite a number of different river basins. «Young» mountain ridges of the Small Caucasus is a good candidate for that. Visible catchment areas of different types on mountain surface being a manifestation of 3D-structure of fracturing for rocks are easily recognized by available space images. We have used the approach under our conception to select the universal structural elements for so called «landscape pattern». Because of the 3D-watershed is an open system under different dynamic processes, we discuss the facts of verification for interaction between surface water and groundwater in the river basin function by observable nature phenomena



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## Ecological-geographical researches of intermountain depressions of Altai

Natalia LEGACHEVA, Irina ROTANOVA (Russian Federation)

In mountain systems intermountain depressions are the territories which are the most economic development. Depressions are the centers of accommodation of the most part of the population of mountain territories. In a relief of the Altai mountain area intermountain depressions occupy about 12%. For the last 100 years landscapes of intermountain depressions underwent considerable human changes. They represent considerable interest as objects of ecological-geographical research. In the Russian part of Altai allocate 14 large intermountain depressions. Among them the biggest on the areas and economic development: Chuyskaya, Uymonskaya, Kurayskaya, Kanskaya depressions. Conditions warm and moisture security of hollows is defined by a relief. The thermal mode depends on the absolute height of the bottoms of hollows, the moistening mode from a orographic factor. The climate of Altai was never stable: the cold snaps replacing each other and warming are characteristic. To climatic changes of both last and modern time, there correspond changes of landscapes. In the history of development mountain depressions natural and human developments are combined. For the last some thousands of years in the studied territory three types of environmental management were replaced: 1) the appropriating economy of hunters; 2) nomadic cattle breeding; 3) the diversified economy of modern time which is based on a combination of agriculture, cattle breeding and industrial branches of economy. Main types of influence: cutting down of forests, plowing of lands, cattle pasture, construction of industrial facilities and settlements. The analysis of human impacts on a mountain depressions is made and degree of their changes is defined. The complex ecological-geographical assessment of large intermountain hollows of the Altai mountain area is carried out. A series of ecological-geographical maps for the purpose of rational environmental management and nature protection activity is created.



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IGU 2015 – 0464

## Climate change and the identification of ecosystem services in Northern Altai conditions

M. SUKHOVA, O. ZHURAVLYOVA, N. KOCHEEVA, A. KARANIN, Yu. NIKOLCHENKO (Russian Federation)

We identified ecosystem services in Northern Altai. This area possesses a huge variety of natural climatic conditions due to high landscape diversity. The highest ridges rise almost up to 2500 m. Northern Altai is famous for its huge recreational and agricultural potential. The expert evaluation method enabled to give a fair estimation of the quality of the services rendered by the ecosystems of Northern Altai. Leopold matrix provided the estimation of spatial differentiation of the ecosystem services of the region of interest. As a result the matrix chart reflecting the effects of influence of changing conditions of environment on the quality of the ecological service rendered by the geocomplex was obtained. Two factors were identified as basic threats to the ecosystem service state: climate change and economic activities. The regional climate change was identified on the basis of the analysis of the meteorological data from 1963 till 2013 (the maximum period of observation in Altai). As part of the study the key phenomena whose character changed to a greater degree were defined. The impact of the human factor, first of all, consists, in the pollution of air, water pools, the degradation of a soil cover, and biodiversity reduction. As a result it was stated that regulating eco-services on a bigger part of the area under study (56 %) show a stable condition. In the accepted criteria the conditions of the provisioning eco-services on a bigger territory vary from "deterioration" to "a stable condition". The most optimistic situation develops at the estimation of tendencies in the conditions of supporting eco-services. The stable condition prevails, and slight improvement of cultural ecosystem services is shown.



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IGU 2015 – 2006

## Tensity of geomorphological conditions of the marginal mountain belts of Pacific Rim

Ekaterina LEBEDEVA, Dmitry MIKHALEV, Sergey SHVAREV, Veniamin GOTVANSKY (Russian Federation)

Geology-tectonic and physiogeographic features of the marginal mountain belts of Pacific Rim determined high intensity of its morpholithogenesis which is expressed in the catastrophic appearance of many geomorphologic processes as well. As targets of research we selected NW and SE segments of Pacific Rim – the Russian Far East and the Andes mountain system. Territories, defined by propensity to catastrophic relief processes developing, we suggest to call the zones of increased tensity of geomorphologic processes or conditions (places) of high geomorphologic tensity. Methods of mapping of geomorphologic tensity are based on analysis of all relief forming processes of territory, features of relief morphology and presence of forces causing the extreme character of background processes of territory (seismic movements, anomalous hydrometeorological events and others). Tensity of geomorphologic processes small-scale map (1:2.5-1:8 mn) allowed to identify zones of greatest risk of geomorphological disasters caused by natural factors and allocate areas for further more detailed studies. In the Far East region geomorphologic tensity generally increases from West to East towards the Pacific Ocean: it was estimated in 7-10 relative points for Western Okhotsk Sea coast, 10-12 for the Sakhalin, 13-15 - for the Eastern Kamchatka, 16 - for the Kurils. At SE Pacific sector the Peruvian Andes western megaslope is the zone of maximum risk of catastrophic processes developing - tensity reaches here 15-16 relative points. For the eastern Andes megaslope this index is 9-13 points, and for Altiplano it fluctuates within 6-10 points



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# Assessing temperature sensitivity of subalpine shrub phenology in semi-arid mountain regions of China

Zhibin HE, Jun DU, Junjun YANG, Longfei CHEN, Xi ZHU, Xuexiang CHANG (China)

Subalpine shrubs are undergoing, or have experienced profound changes by force of recent climate anomalies, such as the alteration in temporal niche of phenophases and the dynamical interaction with ambient conditions. In this study, we retrieved the time series (2000-2013) of satellite-based phenological transitions for subalpine shrubs at five individual sites in the Qilian Mountains in northwestern China. Our goals were to identify the climatic constraints on the timing of leaf-out and leaf-fall, and to project these phenological patterns under the future climate conditions. To achieve these goals, the relationships between these regional phenological events and climate variables were investigated with univariate and multivariate time series models, and the future phenological dynamics were forecasted for two decades based on the best predictive models under the A2 and B2 of IPCCs Special Report on Emissions Scenarios (SRES). Our results generally revealed site-dependent phenology-climate relationships, which involved an immediate phenological response to the mean or minimum temperature in the corresponding month of occurrence, and a lagged cumulative climate effect across preceding months and seasons. Most previous studies have shown the averaged temperature during a certain period as a limiting factor for plant growth. However, our results also provided an evidence for the minimum temperature controls of the development of phenological events in the subalpine shrublands, possibly due to a close association with the frequency of frost risk in spring and autumn. Under future climate conditions, an overall lengthening of the active growing season is expected at each of the study sites depending on elevation.



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## Contextual Analysis on Sustainability and Resilience in Community-based Tourism Response to Change: the Reyli Village in Taiwan Mountain Regions

Chin-cheng NI (China)

In years sustainable development has prevailed worldwide as a dominant paradigm to reconcile economic development and the global change; however, "unsustainability" is still to be found in various corners of the world, especially in mountain regions. The earthquakes and typhoons strike Taiwan frequently. Under the complex circumstances, the sustainability and resilience of community-based tourism become the highlight of tourism problems. This study used contextual analysis for the qualitative approach by field survey, participant observation, in-depth interview, and selected the Reyli mountain village as a case study. One of the findings indicates that economic development is regarded as top priority of dimension on sustainability, and social or environmental considerations are subordinate and belonged. The other result is that the tourists would adapt to avoid of natural hazards and make reduction of their tour risks from the visit of specific tourist attraction spots to the experience of heterotopia for an escape in residence, from the sightseeing of natural scenery to seeking of leisure or personality restaurant, and from sport tourism (e.g. mountain hiking) all year long to event tourism (e.g. festivals of wisteria and firefly) only in spring. On the other side, the business entrepreneurs would make their efforts to promote tourism in slack seasons. The final finding is that the good recovery after disasters is caused by diverse economy (e.g. tea, sugar industries) through their good business alliance inside and outside of Reyli village. But the resilience in community construction presents the weak social cohesion after the catastrophic typhoon, Morakot, of 2009.



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IGU 2015 – 4335

## Lowland-foothill landscapes of the North-Eastern Caucasus as mountain-plain geographical ecotone

Zagir V. ATAYEV (Russian Federation)

To identify the place and role of the lowland-foothill landscapes of the North-Eastern Caucasus in the system of the interaction and interrelationship of mountain and lowland landscapes along with traditional methods of study were used also quantitative data allowed to analyze geological and geomorphological basis for the formation of landscapes by means of digital models of the relief. The analysis of an erosive partition and also the areas occupied by slopes of varying steepness and exposure within the actual mountain, foothill and lowland parts of the region allowed to establish that the lowland-foothill landscapes are characterized by the special nature of erosional dissection than mountain landscapes and as a set of locations, expressed through the combination of slopes of varying steepness and exposure. Along with the analysis of geological and geomorphological landscapes bases there were also analyzed the climatic factors of differentiation and integration of the lowland-foothill landscapes. Unlike earlier offered approaches for the characteristic of climate relying on the static data of hydrothermal regime frequently for the whole year there were studied the interannual variability of these indicators and characterized the seasonal and interannual dynamics of landscapes. The final results of the research allow us to conclude that the proposed set of qualitative and quantitative parameters of the lowland-foothill landscapes should be allocated to a separate classification unit. Such a conclusion is based not only on the analysis of the pattern of erosional dissection territory but also on the nature of the climatic conditions of the contact of foothills, namely: more higher variability of the intralandscape climate foothills and more significant amplitude fluctuations in the value of annual precipitation, and accordingly the moisture conditions. So, within a few decades moisture conditions within these landscapes vary from dry steppe to the forest which is not typical for the altitude-zonal landscapes of the mountain structure and zonal plain landscapes.



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# C12.33 Poltical Geography

## Bordering Eurasia: Politics, Power, and Political Geography 1

**Chairperson(s):** *Paul RICHARDSON, Akhinaro IWASHITA*

- Conceptualising Neighbourhood Beyond European and Eurasian Imaginaries
  *James SCOTT (Finland)*
- On Multiscalar Production of Borders: Experiences from the Finnish-Russian Interphas
  *Jussi LAINE (Finland)*
- Post-Soviet boundaries: territoriality, identity, security, circulation
  *Vladimir KOLOSOV (Russian Federation)*
- The Regional Convergence of Russian and Iranian Geopolitics: Changing Contours of Eurasia
  *Deepika SARASWAT (India)*

## Bordering Eurasia: Politics, Power, and Political Geography 2

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- The geographic map as a perceptual and propagandist weapon in geopolitical struggles for the formation of national identity
  *Arnon MEDZINI (Israel)*
- Understanding the construction of cross-border metropolitan regions through the integration process
  *Frédéric DURAND (Luxembourg)*
- Bordering Eurasia: the role of the EU and of local actors and state politics in the case of Cyprus
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## Bordering Eurasia: Politics, Power, and Political Geography 3

**Chairperson(s):** *Paul RICHARDSON, Akhinaro IWASHITA*

- Failure of Sykes-Picot and Borders that Lost Meaning: The Case of Syria
  *Nurettin ÖZGEN (Turkey)*



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- Japan's borders and the 'militarization' of sovereignty
  *Edward BOYLE (Japan)*
- Transformation of the Ethno-Cultural Space of Post-Soviet Trans-Border Regions
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- Russia-Poland cross-border cooperation and development of the tourism in Kaliningrad region
  *Alexander SEBENTSOV, Maria ZOTOVA (Russian Federation)*

**For Kropotkin**

**Chairperson(s):** *Anthony INCE, Simon SPRINGER*

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- "Producing for the producers themselves": Peter Kropotkin's challenge to labour geography
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- Kropotkin's Law of Mutual Aid
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**Russian geopolitics and the former Soviet countries**

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**Borders and illegalities**

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  *Christopher C. NSHIMBI (South Africa)*
- Securitization and Stigma at the Peace Border
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**The critical geopolitics of food**

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- From "routes" to"roots"? Paradoxical pizza and the re-invention of heritage
  *Elena DELL'AGNESE (Italy)*
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**Problems of Contemporary Political Geography and Geopolitics 1**

**Chairperson(s):** *Inocent MOYO, Christopher C. NSHIMBI*

- Cross border economic inequalities, interactions and regional integration: the Francistown-Plumtree interface
  *Inocent MOYO (South Africa)*



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- Analysis of Israel interaction with countries of the region and examination of opportunities and threats after 2000

  *Abedin GHASEMIAN (Iran)*

- International struggle against nuclear terrorism: political and geographical aspects

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**Problems of Contemporary Political Geography and Geopolitics 2**

**Chairperson(s):** *Inocent MOYO, Christopher C. NSHIMBI*

- Towards a single African economic space: informal cross-border traders and the COMESA-EAC-SADC tripartite free trade area negotiations

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- Economic and Political Factors in the Clean Energy Question

  *Gianfranco BATTISTI (Italy)*



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## POSTER EXIBITION

### Bordering Eurasia: Politics, Power, and Political Geography

- Centenary Evolution of Kurdish Geopolitics
  *Nurettin ÖZGEN (Turkey)*

### Problems of Contemporary Political Geography and Geopolitics

- Political and geographical importance of Dagestan as a Russian outpost in the Caucasus
  *Sh. M ALIEV (Russian Federation)*
- The Spectrum of Chinese Political Geography
  *Yungang LIU, Ning AN (China)*
- Methods of studying the geography of political preferences of the US population
  *Peter VARYUSHIN (Russian Federation)*
- Eurasian multiregional system: factors and tendencies of regionalization
  *V.KALEDIN, N.KALEDIN, S.KULIK, R.AMBURTSEV (Russian Federation)*

### Russian geopolitics and the former Soviet countries

- The Characteristics, Position and Development of the Russian Minority in the former Soviet Countries
  *Michaela UCHOČOVÁ (Czech Republic)*
- Geopolitical position as a factor in the development of Russia's foreign trade
  *Alexey URZHOMOV (Russian Federation)*
- Kazakhstan: the territory of the collision of geopolitical interests of Russia and China
  *Alexey URZHOMOV (Russian Federation)*
- Disparities of economic development Post-soviet states
  Dmitriy ZAYATS (Russian Federation)
- Historical and geographical position of the Western border of Russia
  *Dariya ZORINA (Russian Federation)*



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IGU 2015 – 1647

**Conceptualising Neighbourhood Beyond European and Eurasian Imaginaries**

James SCOTT (Finland)

A comprehensive and inclusive engagement with the concept of Neighbourhood requires a perspective that is situated at the nexus between geopolitical practises and social communication. This entails the challenge of grasping the complexity of social reality through linguistic and symbolic framings of the world. Across the 'Eurasian' (post-Soviet) space we are witnessinging the simultaneous materialisation and dematerialisation of borders which are both consolidating and fracturing state territorories, providing spaces for new identities to emerge, and reconfiguring geopolitics at a variety of different scales. These transformations are also challenging the EU's attempts to assemble a Neighbourhood politics of regional cooperation. This contribution will frame 'Neighbourhood as geopolitical idea through an appropriation of Bakhtin's work on dialogism and Yuri Lotman's notion of the semiosphere; this involves interrogating the means through which different imaginaries of Neighbourhood context are being constructed and communicated between the EU and its eastern neighbours within the context of the EU's politics of cross-border and regional cooperation. This includes arriving at understandings of 'Neighbourhood' as a set of ideas and imaginaries that reflect not only political visions but also everyday cultural images and social representations that, among others, politicise the EU's external borders and regional political role.



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**On Multiscalar Production of Borders: Experiences from the Finnish-Russian Interphas**

Jussi LAINE (Finland)

The present geopolitical situation has made the debate on borders, their functions and significance, increasingly prominent. The once so prominent debordering rhetoric has succumbed to more realist notions, underlining the increasing complexity and instability in the world system. Accordingly, the traditional comprehensions of borders have also been challenged – largely because the context in which they were created and existed has also altered. European integration has endorsed concrete notions of post-national polities and borders not only by fostering shared sovereignty and community policies, but also more concretely by supporting subnational cross-border cooperation, and more subtle forms of Europeanisation. The traditional state model is being recalibrated in terms of dispersing of political power, emergence of transnational political communities, conditioning of state sovereignty by interdependencies and interrelations that crisscross state territories. This has also changed the nature of borders and made the distinctions between domestic and foreign policy concerns increasingly blurred. Building on empirical conceptual innovations from the Finnish-Russian border, this paper aims to contribute to the discussion on more open state territories. It suggests that broadening the scope of our analysis allows us to rethink and transform taken-for-granted spatial formations in assessing the impacts of global processes more regionally. In concludes that thanks to the changes in the governance modes, the state is no longer the primary actor, nor is the nation-state the only conception of space to be applied in explaining human interaction.



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**Post-Soviet boundaries: territoriality, identity, security, circulation**

Vladimir KOLOSOV (Russian Federation)

The author comes back to the main themes of his contribution to the Research Companion to Border Studies (D.Wastl-Walter, ed. Farnham, UK: Ashgate, 2011) written more than five years ago: specific features of post-Soviet borders, progress in their delimitation and demarcation, the complexity and dynamics of border identities, political instability and their role in bordering, the spatial pattern of communications and the countries' interdependence. He considers important and sometimes even dramatic changes occurred in identity and territoriality, and the shifts in the world geopolitical vision in post-Soviet states, the politics of bordering and their impact on the functions, the regime and securitization of different boundaries. A particular attention is paid to the international crisis provoked by the 2013-2014 events in Ukraine, to the "circulation – security dilemma in new conditions and to the influence of Eurasian integration on economic and social development of border regions. The presentation is based on an analysis of the recent statistical data on the situation in border areas, foreign trade, cross-border traffic and migrations, sociological surveys and political discourse, as well as on the results of field studies and observations.

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**The Regional Convergence of Russian and Iranian Geopolitics: Changing Contours of Eurasia**

Deepika SARASWAT (India)

With their opposition to the US presence in their region, commitment to a multi- polar world order and both experiencing Western sanctions and isolation, Russia and Iranian geopolitical imaginations are converging in Eurasia. While Islamic republic has a favourable geographical location between South- East Europe, West and Central Asia, it has cautiously used its historical cultural – religious ties with former soviet republics in Caucasus and Central Asia in constructing a larger regional role and has been careful not to challenge Russian geopolitical influence in its former republics. The US invasion of Afghanistan and Iraq and spectre of 'regime change' in Iran has led Iran to cement and expand its ties with Eurasia. Iran has strived for permanent membership in Shanghai Cooperation Organisation, the largest regional security organization in Eurasia, and has sought Russia's help in this regard. The forthcoming expansion of SCO to include Iran along with India, Pakistan and Mongolia, will further integrate Iran with Eurasia. Moreover, Iran by virtue of its geographical location and historical linguistic – cultural ties with its neighbours in the region will determine the contours of Eurasia in its South – West extremity. The paper argues that the Eastern orientation of Iranian geopolitics and regional convergence between Iran and Russia have implications for geopolitical construct of Eurasia.



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IGU 2015 – 3274

**Fragmentation of Political Space: Basic Forms and Modern Trends**

Fedor POPOV (Russian Federation)

This report presents a theoretical analysis of the centrifugal processes of political space fragmentation. Such processes are based on the territorially localized transfer of power (in whole or in part) from the state to the initially non-state or subnational actors. The transfer may be confirmed or denied by the government so it may be de jure or de facto fragmentation. Sanctioned transfer of all state functions leads to the secession and state borders transformation, if the processes involve only part of them it means devolution. As for de facto fragmentation, it is hard to provide a clear demarcation. The extreme forms of such processes are usually defined by the term «de facto secession». De jure secession leads to the formation of new sovereign states or to the transfer of the territory from one state to another (i.e. irredenta). De facto secession leads to the appearance of ungoverned areas and at times to the creation of quasi-states of different types (insurgent states, de facto states etc.). Although current norms of international law impede de jure secession, political movements pursuing such an aim play a significant part on the world stage. Such movements are defined by the term «secessionism» (should not be confused with «separatism», «autonomism», «irredentism» etc.). In broad interpretation it also covers the movements with different aims who provoke de facto secession. Modern development trends of international system leave to secessionism a wide range of opportunities. The most effective way of reducing intensity of such processes is to affect the motivation of secessionists and their potential sympathizers.

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**The geographic map as a perceptual and propagandist weapon in geopolitical struggles for the formation of national identity**

Arnon MEDZINI (Israel)

Conflicts between countries about issues such as territorial ownership, exact location of border routes, and tagging names of places on maps are among the most charged geopolitical issues in relations between countries. In these relations, the important role of geographic maps which serve as a tool for creating the territorial image and conceptual map of the political space is well known. The cartographic representations on maps have become one of the many battlegrounds in which a political battle has been waged around claims of ownership of territory. Being that territory plays an important role in establishing nationality, one cannot differentiate between national identity and the connection to specific territory, and the geographic map is what expresses this connection. However, studies show that the cartographer cannot avoid representing his own subjective point of view on the maps, which makes it possible to use a map as a propaganda tool which aims at focusing a person's thinking on subjective choices determined by the interests of whoever ordered the map. The choice of names, when tagging places on the maps, also has dramatic geopolitical significance. In recent years, digital maps have become the most common cartographic sources of knowledge. The digital environment enables the production of maps more quickly and easily, the maps are more up-to-date, contain information in new and varied areas, and are easy and cheap to disseminate; therefore, their influence on people's conceptions is more powerful than in the past. The aim of the lecture is to examine how digital map cartographers cope with the political pressures exerted upon them in issues of locating borders in disputed territory and in the tagging of names of places on maps.



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**Understanding the construction of cross-border metropolitan regions through the integration process**

Frédéric DURAND (Luxembourg)

In a context of state reconfiguration and of borders' mutations, the cross-border metropolitan regions constitute privileged areas to observe the socio-economic transformations at work today. The purpose of the presentation will focus on the cross-border integration process and its impacts on the structuring of these specific spaces. The ambition of this paper is to grasp the complexity of this concept, to examine its nature, composition and dynamics. What does 'cross-border integration' mean today in Europe? What are the consequences of cross-border interactions on the identities and reconfiguration of political power within the cross-border metropolitan regions? In order to respond to these questions, a three-step approach is proposed: First of all, a scientific literature review will be undertaken to know how cross-border integration is considered by border scholars, but also to identify some limits with these definitions. Secondly, the cross-border integration concept will be deconstructed to better understand its functioning and mechanism. To go beyond the limits identified in the first part, a model will be shown: it will depict the multi-faceted process of cross-border integration, divided into four dimensions (structural, functional, institutional and "ideational"). The third part will consist in applying this model. Some results of fieldworks conducted in the Oresund region (Copenhagen-Malmo) and in the Eurometropolis of Lille-Kortrijk-Tournai (in the frame of the EU-FP7 project EUBORDERSCAPES) will be presented. A set of political and economic actors have been interviewed to know their meanings and perceptions on cross-border integration, and their feelings on the cross-border cooperation dynamics.



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**Bordering Eurasia: the role of the EU and of local actors and state politics in the case of Cyprus**

Anna CASAGLIA (Finland)

In the contemporary context of global fluxes and supranational politics, borders continue to play an important role in defining identities and configuring power relations, which makes them an essential lense through which we can understand social and geopolitical change. The presentation takes into consideration the case of Cyprus, still divided between the recognized Republic of Cyprus and the unrecognized Turkish Republic of Northern Cyprus, despite its annexation to the European Union and the attempt to solve the long lasting dispute between the two communities and political entities. With the accession, the ceasefire line dividing the island came to be a sort of EUropean border requiring a specific set of regulations and a peculiar application of the acquis communautaire. European interests that pushed towards the entering of Cyprus in the EU are generally recognized in creating peace in the Eastern Mediterranean and in taking seriously its self-definition as a multicultural and security actor protecting minorities and human rights. The expected outcome of accession, which was initially supposed to enhance a solution of the long-lasting conflict, has been jeopardized by a much more articulated reality, entailing the role of local actors as well as state politics that have affected the process, much beyond a superimposed reframing of borders and state configurations. The argument here presented highlights the role of local actors and national objectives in determining the result of the EU political intervention in the complex Cypriot reality and in the continuous redefinition of the island's borders and related identity features.



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**Failure of Sykes-Picot and Borders that Lost Meaning: The Case of Syria**

Nurettin ÖZGEN (Turkey)

Sykes-Picot (1916) is the name of areal-scaled sharing treaty having been contracted by the UK and the French to accomplish the designing geopolitics in the Middle East. By means of this treaty, made up borders of countries in the Middle East were drawn to render service to the colonial interests of such two countries and the whole region has been completely brought under the control via dependent governments. Unlike the nation states established in Europe, these made-up countries in the region have no high-level national consciousness and ideal unity since such made up political borders/maps in the Middle East were designed in accordance with the designing geopolitics of such countries having signed Sykes-Picot Treaty. More importantly, it is regarded that such designing geopolitics forms a basis for various problems. Regardless of ethnic, religious, sectarian and political belonging of the peoples in the Levant, this land has been determined by means of designing geopolitics to completely serve for a pragmatic structure, as a result, new countries and states have made up. Syria is the typical instance of this design. The border of Syria having been established under the French sovereignty was drawn by the Sykes-Picot Treaty and Turkey-Syria border was determined with Ankara Treaty in 1921. Determination of this border, rather than the public's approval and preference in the region, is problematic in many aspects as the product of an imperial design. First of all, various religious and ethnic groups that have been deprived of representation disrupted political unity in Syria. This circumstance formed a basis for emotional displeasure and social disintegration among identities imprisoned within the same borders, but having no representation rights, accordingly has considerably weakened the skill of living together. Such social disintegrations were finally revealed with Arab revolts. Hundreds of thousands of Kurdish population in Rojava having no any social security, marginalized and exposed to disidentification by the government broke off the relation with Damascus government and headed towards Kurds in Turkey and the population in Kurdistan Regional Government (KRG) with whom they have close relationship by affinity and they have developed commercial, social and cultural relations. In this respect, such circumstance indicates that the border of Syria made-up with Sykes-Picot Treaty has failed. In this study, along with the borders of Syria and the political system made-up with Sykes-Picot Treaty, the current status of the Kurdish political movement in Rojava has been examined in terms of applied geopolitics and probable predictions have been made.



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**Japan's borders and the 'militarization' of sovereignty**

Edward BOYLE (Japan)

Immediate post-Cold War optimism regarding a resolution of Japan's Northern Territories Issue with Russia seems a lifetime ago. Rather, as the dispute has dragged on it has increasingly come to be associated with two others, those of Takeshima and the Senkakus. This reflects the Japanese state increasingly being influenced by a militarized notion of sovereignty in the resolution of such disputes. Such a militarization does not solely refer to the use of the military force in these conflicts, although this is certainly one aspect of the issue. Rather, it seeks to invoke the fact that such conflicts become characterized in military terms as redoubts that must be held in order to preserve Japan's sovereign status, with the maritime territory of the EEZs serving as the terrain on which this battle occurs. The sovereign border of the state becomes a military necessity, a line to be held at every point and preserved at all costs. Such an understanding is at odds with the realities of not only Japan's early modern and imperial past, but also the 'classic' nation-state era that supposedly characterizes the post-WWII period. During this period, despite any excessively absolutist conceptions of state sovereignty, we see a flexible attitude to the resolution of such border issues. However, rather than being a unique reflection of potential Japanese rearmament, such sovereign militarization is visible both across Eurasia and indeed worldwide, with the growing prevalence of walled borders indicative of a desire to violently simplify notions of state sovereignty that are seemingly under threat from the increasing visibility of flows running against its control. This paper shall set out what this sovereign militarization means for Japan's borders within this wider context.



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**Transformation of the Ethno-Cultural Space of Post-Soviet Trans-Border Regions**

Tatiana GERASIMENKO (Russian Federation)

This presentation is devoted to characteristic aspects of the externally enfluenced transformation of ethno-cultural space of the post-soviet trans-bordier regions. Orenburg region we will use as an example to illustrate changes that followed this new formation. The Orenburg region is a part of the Orenburg-Kazakhstan transboundary region. The region has become like this as a result of post-Soviet delimitation of frontiers.Our research is concentrated on characteristic aspects of externally influenced transformation of space for the Orenburg-Kazakhstan region in retrospective, in the present and future periods. The space has been formed and developed as a uniform ecological, ethno-cultural and economic area for a long time. Now they manifest more and more differences. Orography, climate, hydrological regime, landscapes affect the settlement system and ekistics features that determine the choice of the place of settlement, the range of building materials, layout, character of development. However, in Kazakhstan there appeared dispersed settlements, reflecting the ongoing economic changes (the development of farming, distant-pasture cattle). In some ways this is a return to their former way of life. We see economic divergence. There are different tax systems. This creates difficulties for the creation and registration of foreign and joint companies. There are different prices for the same goods and services. In neighboring countries laws are different. Although previous uniform legal space is broken, there are 100 companies with participation of the Kazakhstan capital in the region. The territorial structure of the regional geographical space has been transformed. Modern realities call for new ways of development. The proximity of borders and traditional contacts with Kazakhstan should be used. Growth of economic globalization and integration, geopolitical priorities, establishment of the Customs Union of Russia, major international infrastructure projects, geopolitical orientation of external trade of Kazakhstan increase the significance of the cross-border provisions.



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**Russia-Poland cross-border cooperation and development of the tourism in Kaliningrad region**

Alexander SEBENTSOV, Maria ZOTOVA (Russian Federation)

The objective of the paper is to analyze the influence of cross-border cooperation (CBC) in Russia-Poland borderland on the development of tourism in Kaliningrad region. Tourism as an industry of the Kaliningrad region's economy has a big potential for its development. Many researchers concern on internal conditions (many objects of the Heritage of the Culture and Nature, maritime location etc.) and limitations (lack of the medium-priced hotel, scarcity of English-speaking staff in service sector etc.) for the development of the tourism. A part of the scientists distinguishes CBC as a relevant factor of development for tourism industry. At the same time, neighbors of Kaliningrad region are usually perceived as business rivals, which offer a good services and low prices. When local-border traffic regime in the Russia-Poland borderlands was established, more and more Kaliningraders became visiting Poland not only as a consumers, but and as a tourists too. Many Kaliningrad tourists visit the neighbor Polish voivodeships for outdoor recreation on holidays and vacations, combining it with buying consumer goods. As for Polish citizens in Kaliningrad region, they cross the border only to buy limited list of the goods (petrol, alcohol). On the average Polish citizen arrives in Kaliningrad region only for 1 or 2 hours, and almost never visits region with touristic goals. Attraction of the tourists from neighboring countries is a concern for the regional Ministry on tourism. To change the asymmetry of touristic flows it is crucially important to revalue the role of CBC for Kaliningrad region. CBC is a chance to attract the tourists from the neighboring countries and promote cross-border touristic products that would be common for both countries. At the same time, it needs to realize if de-bordering processes is challenging for Russian identity in Kaliningrad region.

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**The Ethical Dynamics of Economic Change**

Ruth KINNA (United Kingdom)

Kropotkin's essay' The Coming Anarchy' was a companion piece to 'The Scientific Basis of Anarchy', also published in the journal The Nineteenth Century in 1887. It might be read as a conspectus for the work Kropotkin subsequently produced: the essays which composed Fields, Factories and Workshops followed shortly afterwards, and the arguments he sketches in the essay are elaborated in Modern Science and Anarchism, Mutual Aid and Ethics. The importance of the essay is that it syntheses the themes that he explores in this larger body of work. Kropotkin's suggestion of anarchy's coming drew on a conception of geography and global change that he developed in close collaboration with Elisée Reclus. This contested the notion of the geographical pivot of history advanced by Halford MacKinder. The coming of anarchy outlined a genuine possibility, but it was contingent on the power of communities to capitalise on the decentralising tendencies he detected and their reconfiguration of local economies. While Kropotkin's assessment of the likelihood of anarchist change wavered in the nineteenth century, he remained convinced that it was possible and necessary to abandon capitalism by challenging the monopolistic propensity of states and the system of international trade on which it was based, gearing production instead to the satisfaction of needs. This paper outlines the principles on which he imagined this economy would operate and some of the micro projects he championed, setting both in the context of Kropotkin's internationalism and his defence of the cultural specificities that global networking and federation involved.



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**Learning Through The Soles of Our Feet: Kropotkin, Geography, and the Case for Unschooling**

Simon SPRINGER (Canada)

Schooling is a form of misopedia and a fundamental structure in conditioning societal acceptance of domination in other registers. Peter Kropotkin once wrote, "the education we all receive from the State, at school and after, has so warped our minds that the very notion of freedom ends up by being lost, and disguised in servitude." The subordination of children begins with the misguided notion that they are incapable of autonomy, reinforcing a dichotomous understanding of adult/child or teacher/student. The hidden marginalization of children has long been recognized in geographical scholarship, but few linkages have been made to how schooling actually encourages such neglect. Schooling should not be confused with education. The former represents the interests of oppression, moulding societal consciousness to accept the conditions of subjugation. In contrast, education is a process of self-discovery, an awakening to one's potential, and a desire to see such abilities realized. To ensure the absence of coercion in education children need to explore for themselves, making their own decisions about what their interests are, and how those curiosities might be fulfilled. Presenting a broad range of opportunities is crucial, but the decision about what path to follow should be determined by the child. When bound to a classroom or chained to a hierarchical pedagogy we mistake obedience for education. Learning, as geographers recognize, occurs 'through the soles of our feet' and when children explore the world through unschooling, they live into their creative potential, opening an aperture on alternative ontologies that are more in tune with immanence. Unschooling is, in short, one of the most powerful forms of learning we can engage.



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**"Producing for the producers themselves": Peter Kropotkin's challenge to labour geography**

Anthony INCE (Sweden)

A central element of Kropotkin's essay, The Coming Anarchy (1887), is his foregrounding of the traces of communal and egalitarian systems of production from past eras that simultaneously haunt and shore up individualised, competitive capitalism. While Kropotkin is keen to avoid idealising such past systems, this is indicative of a major theme within his works. In this presentation, I seek to bring Kropotkin's works on the communism of labour into conversation with two distinct but related themes in labour geography. First, current debates within labour geography rarely touch upon the organisational communality and interdependence of workers as a factor in their spatio-temporally situated agency. Labour agency literature has maintained a core focus on the dialectical relationship between workers and employers, yet the autonomous agency of labour identified by Kropotkin may contribute a more nuanced view of these dynamics. Second, labour geographers have been quick to identify the variegated impacts of neoliberalisation's uneven relationship with past (e.g. Keynesian, Soviet, or colonial) modes of production, and have indicated tacit support for reversal to post-war social democracy. Thus, in the geographical imagination of this sub-discipline, there is a notable absence of the future. On the contrary, while Kropotkin draws heavily from a reading of the historical development of society, his is a theory explicitly oriented towards a dynamic future that could help to productively re-cast the priorities of labour geographers likewise. In sum, I argue that Kropotkin's ideas show fragments of a more hopeful, worker-driven, and liberating labour geography.



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**Kropotkin's Law of Mutual Aid**

Lee Alan DUGATKIN (United States of America)

Evolutionary biologist, geographer, and anarchist Peter Kropotkin crisscrossed Siberia for five years on what amounted to a natural history expedition. Years later, he spoke to crowds of thousands when he toured America, was expelled from many of the respectable countries of Europe, was chased by the secret police, was jailed on numerous occasions, and undertook a daring escape from the Peter and Paul Prison that garnered headlines in the New York Times. He wrote books on a mindboggling array of topics, including the orientation of the mountain ranges of Asia, anarchism, socialism, communism, penal systems, the coming industrial revolution in the East, the French Revolution, ethics, and the state of Russian literature. But Kropotkin was best known for almost singlehandedly forcing biologists to ask themselves whether natural selection inevitably led to a dog-eat-dog world, or whether prosocial behavior could also be the product of the evolutionary process. Kropotkin was a hard core Darwinist at the time, and while he was certain that natural selection was the predominant force driving the evolution of behavior, he was equally certain that natural selection could, and usually did, also favor altruism -- what he referred to as mutual aid. Over time, he developed what he came to call "the law of mutual aid," which encompassed not only his ideas on evolution, but also on geography and politics.



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## "Anarchy: the highest expression of order": the coming society according to Pyotr Kropotkin and the Anarchist Geographers

Patrick MINDER, Federico FERRETTI (Switzerland)

In 1851, in his first work Le Développement de la liberté dans le monde, the strict Kropotkin's collaborator Élisée Reclus (1830-1905) put one of his most famous statements: "Anarchy is the highest expression of order". This phrase, in spite of all commonplaces on anarchy intended as chaos or absence of rules, could be intended as a manifesto for the Communist Anarchism exposed by Kropotkin, with propaganda aims, in his pamphlet The Coming Anarchy. In my paper, I try to explain how the contents of Coming Anarchy are the fruit of a common elaboration by the anarchist geographers Kropotkin, Reclus and Lev Mečnikov, who built together the theory of the Mutual Aid, then popularized by Kropotkin in his famous book on this topic. My main hypothesis is that, in Coming Anarchy, we find an early draft of the topics related to Mutual Aid, namely the importance, for a future society, of spontaneous forms of social organisation existing independently by the State. The texts Evolution et Révolution by Reclus, and Revolution and Evolution by Mečnikov, elaborated in the same years, express the same hope for a revolution drawing not on a unique violent clash breaking the bourgeois society, but on a progressive liberation based on growing individual and collective consciousness. This work, however, is not intended as a simple historical or philological exercise, as I will stress, in my conclusion, the effectiveness of the exposed concepts for present social debates, as well as for the present rediscovering of anarchist geographies. Keywords: Anarchist Geographers; Mutual Aid; Pyotr Kropotkin, Elisée Reclus, Lev Mečnikov.



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**The logic of poker and power in the Ukraine (and Crimea) case**

Fabrizio EVA (Italy)

In the 2014 the cases of Ukraine-Crimea and of the separatist eastern provinces of Ukraine were something new in the world geopolitical dynamics. It happened in Europe and this time, in different way from the Yugoslavia case, the two major military world power, USA and Russia, are or could be physically involved thanks to the common borderline of NATO and Russia. And thanks also to the geographical and iconographic location of Ukraine according to the Russian perception. The "stability" of the pretended international state system is the mantra of the global "Order". A "state" system in which actually was not so important the institutionalization of the states (recognized, failed, quasi-, de facto, non-state) if they were effective pieces of the "stability" puzzle. Only five-to-ten small group of decision makers are the countries called "the international community" claimed by the mass media and by the political leaders. Among them the logic of poker (when and how doing a bluff) and the assertion of power seem to be the main concern and geostrategic-political tools. For solving (or prevent) a critical geopolitical dynamics which is going to drift to a violent conflict it would be necessary acting quickly considering the real factors of solution which are not the iconographic concept of "sovereignty" and "territorial integrity" (widely used in the Ukraine case), as usually declared by political leaders and spread by the mass media, but 1) the shape of the territory and the climatic conditions, 2) the iconographic premises (history, pretended heritage, etc.) of the human grouping in the local territory, 3) the language and the "genre de vie" of the existing human groups and their distribution in the territory. Accepting the idea that human groups are able to decide along a bottom-up path and that they are able to take "rational" and not only emotional decisions are the basic premises for solving crisis; and giving time along with granting to everybody a minimum level of economic conditions.



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**Geopolitical vectors of post-Soviet countries**

Tatiana POTOTSKAYA (Russian Federation)

After the collapse of the Soviet Union 15 countries had been formed. Only Russia has the obvious geopolitical status ("world power") while the rest of the geopolitical status is not so obvious. Therefore, the purpose of the study is the identification of potential allies and adversaries in a new and very important for the Russian region of the world (according to the "Foreign Policy Concept of the Russian Federation") with ambiguous vectors of its foreign policy and economic preferences - the post-Soviet space. One way to achieve this goal is the establishment of the integration strategy of the region under study, because a new independent state actively used the integration ties in the formation of its statehood. Many of them saw the path to their own success in cooperation with other, often more for strong states and integration processes are considered as a necessary condition of its existence and further development. We formulate the results of the study of contemporary geopolitical status of the post-Soviet space: identify the types of integration processes in this region (country groupings within the CIS; subregional groupings of countries, bringing together countries that are in conflict with Russia's geopolitical interests). Based on it there are isolated and analyzed types of integration strategies studied countries (dynamics): pro-Russian, pro-European, pro-Russian alternative, uncertainty. There are revealed Russia's place in foreign trade of each type of integration strategy, as well as the place of each of the countries in the region in foreign trade of Russia. Along with the integration strategy of Independent States, there are accounted integration strategies that are partially recognized states (Abkhazia, South Ossetia) and unrecognized states (Nagorno-Karabakh, Transnistria), located on the former Soviet Union.



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**Sisters at a crossroads: economic dilemmas of the former Soviet countries between West and East**

Maria Stella CHIARUTTINI (Italy)

Less than five years ago, Mr. Putin put forward an ambitious proposal for a unified continental market stretching from Lisbon to Vladivostok, based on a visa-free regime and common energy, industrial and educational policies between Europe and Russia. Theoretically, nothing more sensible than complementing the industrial strength of Europe with the resource abundance of Russia in a truly Eurasian scenario. At the moment, all this appears to be mere wishful thinking. After the dissolution of the USSR, Russia has tried in many ways to keep the former Soviet states under its wing, initially through the establishment of the CIS and more recently with the launching of the Eurasian Economic Union. Its endeavours have been increasingly frustrated by the growing engagement of the European Union in the region. The question about the future of the post-Soviet space is particularly complicated due to the intertwining of political, ethnic, religious, military and economic issues involving Russia, the EU and the former sister republics besides their Southern and Eastern neighbours, not to mention the United States. Although this is not the only side worth exploring, the paper considers the evolution of the economic relationships among these actors before the outbreak of the Ukrainian crisis on the basis of international trade and foreign investment data. These of course should not always be taken at face value, not simply because of the well-known inaccuracies in the reporting of some countries, but more fundamentally because of the "matryoshka dolls" pattern of international investments characterising today's global economy, as the case of Cyprus clearly demonstrates.



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**Kazakhstan: between the Eurasian integration and state building**

Maria ZOTOVA (Russian Federation)

The objective of the paper is to study the impact of Eurasian integration on the processes of state- and identity-building in Kazakhstan: revisiting the historical past and particularly the events of common history with Russia. The paper is based on an analysis of official speeches and interviews of the country's President, news programs of the main TV channels throughout the year, the content of post-Soviet school textbooks on history and geography, as well as on opinion polls regarding the perception of Russia by different generations. It shows that despite integration within the Customs Union and the Eurasian Economic Union, Russia is viewed in Kazakhstan as a significant "other" that legitimates the actions of national elites in the eyes of population. This vision often determines political rhetoric and the content of school textbooks written in the spirit of "national pragmatism." The author also examines the perception of integration with Russia: whether it is considered in Kazakhstan as an association of equal partners, a maximal rapprochement or a cautious pragmatic interaction. In this context, it is important to assess the nature of today's cross-border economic integration and its dependence of the institutional conditions and political factors. Positive shifts still are determined not so much by common economic problems but by subjective factors of national, regional and local level.

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**Can massive barriers prevent the Immigration of hungry immigrants from Africa into Europe?**

Lilach ARI, Arnon MEDZINI (Israel)

Twenty five years ago the famous wall which divided Berlin fell; the collapse of that wall created hope for a new world. However, it seems that all over the world, globalization has not fulfilled dreams of peace and unity—the very opposite is true. The world has not stopped constructing more and more walls and divisions between sectors, countries, classes, and religions. Some of these fences have been built for security purposes, others against terror, and yet other fences were built in order to prevent poor immigrants or refugees of ethnic cleansing from finding shelter. Europe has always been a major destination for migrants from African countries and the Middle East region. Hundreds of thousands of immigrants from these countries, characterized by poverty and oppressive regimes, view the European continent as a major immigration destination. It appears that in recent years, waves of illegal immigration to Europe are steadily increasing. To a great extent, this is because of the upheavals in the Arab world which are causing the movement of tens of thousands of residents who wish to emigrate. So for example, the civil war in Syria adds new potential for refugees who wish to emigrate at any cost, or the fall of Gaddafi's regime in 2011 turned Libya into a new regional center for smuggling immigrants to Europe from North and Central Africa. The goal of the lecture is to examine how the separation fences influence the immigration data and immigration routes from Africa and the Middle East countries to Europe. In addition, we will discuss the legitimacy of the fences and the various ways in which the policy of erecting fences is determined in a number of immigration countries in Europe.



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**Ukraine's border conflicts after 1991: the role of private actors**

Elena DABOVA, Oksana GRIGORIEVA (Russian Federation)

After the collapse of the Soviet Union, the newly independent post-soviet states attempted to build new liberal democratic systems of governance within the borders created by the Soviet regime. Unfortunately, the Ukrainian government failed to maintain peace and social justice and Ukraine's borders changed. Was it possible to peacefully replace the Soviet transnational ideology with Ukraine's nation state ideology while maintaining their borders? Was conflict inevitable given Ukraine's non-homogenous ethnic and religious composition? Could Ukraine become another successful "small state" given its strategic position in Europe? Did non-nation state actors play a role in promoting violence along the socio- cultural dividing lines in Ukraine in order to gain control over regional energy resources? The subject of this study is post-soviet social and economic conflicts along the domestic and international borders of Ukraine. The two main goals are the following: -to characterize socio- cultural dynamics in post-Soviet Ukraine in the context of European energy security architecture with the help of the "new human geography" discourse; -to determine the role of private media and private military units in the Ukrainian domestic and international border conflicts by applying methods of comparative historic and legal analysis. With the collapse of the Soviet Union, the soviet practice of domestic and foreign conflict resolution in Ukraine was disregarded. At the same time, the new Ukrainian political regime did not adopt an alternative tradition to manage ethnic and social tensions and did not develop the political culture required to facilitate a highly demanding energy market infrastructure. The hypothesis of this study is: Ukraine's state borders were manipulated by non-state actors to use national resources. Due to the limitations of international law, non-state actors could use violence without being held accountable by the international community.



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**Borders and illegalities: the practice of zalewa among informal cross-border traders versus cross-border access to social services in the Zambia-Malawi-Mozambique growth triangle**

Christopher NSHIMBI (South Africa)

This paper fulfills two main objectives: first, it interrogates the (il)legality of the practice (of evading revenue and law enforcement authorities) known as zalewa, as well as the practice of accessing social services across borders among informal cross-border traders (ICBTs) and locals in the contiguous border areas of the Zambia-Malawi-Mozambique growth triangle; second, it compares perceptions towards the two practices by various actors, including, among others, the informal cross-border traders, locals, non-governmental organization (NGOs) and State and local authorities in the growth triangle. Legislations, policy reports and scientific publications are thoroughly reviewed and interviews with key policymakers, ICBTs, and locals are conducted. Qualitative and quantitative analyses of data collected from the interviews are also performed. Generally, accessing social services (such as education and health) across borders by nationals of neighboring countries is hardly regarded as undesirable as zalewa by many stakeholders. However, motivations for engaging in zalewa range from convenience, in view of the long and porous borders coupled with long distances to established ports of entry in the growth triangle, to providing alternative means of survival, and the view among locals that it is a practice in which they have traditionally engaged. Representatives from State and local governments of the adjacent provinces in the contiguous border areas should establish trans-border coordinating committees to establish systems for addressing and coordinating, especially, the sharing of the burden of providing social services.



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## Securitization and Stigma at the Peace Border

Adriana DORFMAN, Arthur BORBA (Brazil)

Several measures are in course to "bring security" to the Brazilian border. Since the creation of the Strategic Border Plan (PEF) and of the National Border Strategy (ENAFRON), in 2011, the control and repression institutions are intensifying their presence at the region. This materializes through new equipments, joint operations, surveillance systems and more officers. According to the authorities, this is being done to control and prevent smuggling and guns and drugs trafficking. As we analyze a specific Brazilian border, the Brazil-Uruguay one, we confront the security problems of this region with PEF and ENAFRON unfoldings. Through bibliography research, field work and interviews both with locals and security agents, we came to conclude that this space has many security issues, specially if we keep in mind concepts like human security and citizenship at local level. Yes, smuggling and drugs and guns trafficking occur in this border and must be controlled, but they are taken to the big cities. Other problems such as domestic violence, drugs and alcohol abuse by minors and lack of basic healthcare infrastructure are found in this region and, different from the first group of issues, these ones impact the security of the locals. We then realize that PEF and ENAFRON do not hope to "bring security" to the border, but to the extend control and repression from the metropoles to the border. This not only reinforces the stigma of the border as the space of crime but also do not necessarily respond to the security demands of this space. PEF and ENAFRON need not only to dialogue with other government actions that are trying to bring civil rights and infrastructure to the region, but also re-evaluate the cost of stigmatization of the border in pro of more controlled fluxes towards the centers



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**Transnational Organized Crime across Borders: A Critical Geopolitical Perspective**

Shubhi MISRA (India)

The concept of borders and bordering spaces has evolved a great deal. The contemporary borders exist in varied form. The myriad social interactions ascribe different meanings to borders. The neo-liberal global economic orders have made borders highly interactive and boundaries more permeable. In the wake of these economic changes the fluidity across borders has accelerated so much so that the national security to certain extent gets jeopardised. The political boundary of state is the mark of the territorial bounds. They are susceptible entry point of not only cross boundary exchanges but also to illegal goods and activities. The present study is a nuanced way of looking at contemporary bordering practice. It thrusts upon the securitization of borders. There is an increasing trend of transnational organized crimes taking place between several borders across the globe. Borders are protected in order to put a check on illegal movement of goods, people, arms, drugs, contraband etc, to ensure national sovereignty and safety of the territory. It is highly crucial to balance security and trans-boundary exchanges of all types. The study also analyzes few films on the above themes and tries to bring out the essence of this issue from a critical geopolitical perspective. Key Words- Borders, crime, critical geopolitics.



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**From "routes" to"roots"? Paradoxical pizza and the re-invention of heritage**

Elena DELL'AGNESE (Italy)

A recent survey conducted in the United States registered that 13% of the country's inhabitants aged over two eat pizza every day of the year. This passion is not exclusive of the United States. If pizza is the favourite food there, it is the second favourite food in Germany, the fifth in the UK and the eight in India. This (almost) planetary success started when Italians emigrated overseas, to be later implemented by the acquisition of pizza as an American food, and a subsequent flooding of American-style consumption patterns worldwide. Indeed, pizza is often regarded as typically American, while in Italy it is considered a symbol of national identity (the "Pizza Margherita" recalls both the colour of the national flag and the name of a former Italian queen). However, pizza, is not a "local" product in the traditional sense of the term, since it developed from the encounter between two elements that came from very different locations: pita, namely a flatbread made from flour and water popular throughout the Mediterranean region since the Classical period, and the tomato, a fruit native to Central and South America, brought to Europe following colonization. So, even if such an encounter came about at a precise space–time (in the late 18th century Naples), pizza is an excellent example of "glocal" food, undergoing constant hybridization as a necessary aspect of its success. All the same, even if speaking about its "routes" would be probably more appropriated, a reverse process is occurring todau, which aims to recover pizza as an "authentic" and "genuine" product, taking it back to its "roots"; in this attempt at "cultural capitalization", "Neapolitan pizza" is now a candidate to the Unesco recognition as a intangible cultural heritage.



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**Border changes, identity and banal nationalism of food in the Carpathian Basin**

Péter REMÉNYI, Norbert PAP, Andor VÉGH (Hungary)

The Carpathian Basin has always been home to several nations and ethnic groups throughout history, for the last more than thousand years Hungarian being the major community. The presence of several ethnic groups has meant several influences on cultures, including cuisine as well. Some typical food/dishes has always been associated with different groups (even used in pejorative combinations like potato-gobblers, paprika-land etc.), which from the 19th century has had a growing impact on identity, still used in iconography and every day speech. After the collapse of the Austro-Hungarian Empire and the end of the Carpathian-basin being a single political unit, typical food/dishes became objects of competition, signs of in- and exclusion among communities, nations and states. The many new borders of the region helped this competition in cases where territorial origin and ethnic association of food/dishes mismatched. This has on one hand political/identity reasons (e.g. stuffed cabbage or pálinka) but on the other it is sometimes pure business, like the case of the Tokaj wine region cut by the new border and the right to use the Tokaj brand. Food is also 'utilized' by state authorities and policies: it is still seen as part of national prestige and country image (e.g. in tourism policy), as well as building bricks of national identity backed in Hungary by the official 'Hungarikum' programme. Meanwhile the Turkish influence on food is used as support of 'Eastern Opening' policy of Hungary's foreign policy. In our paper we would like to collect some typical banal nationalist connotations of food from the Carpathian Basin and show how they are used (by the public and by the states) in every day identity making, othering, in- and exclusion and policy making.



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## Recognition of Eco-Labelling and Eco Symbols on Products in Serbia

Larisa JOVANOVIC, Zoran CAJKA, Milan RADOSAVLJEVIC (Serbia)

Environmental labelling is a voluntary method certification of environmental performance of products, and it is being implemented around the world. There are three different classifications of environmental labels. In contrast to "green" symbols that manufacturers' providers label their products, most credible eco-labels are based on aspects of the life cycle of a product. Certification provides independent and impartial third party and it ensures that the process and product are in line with specifically defined criteria and standards of sustainability. Eco-labelling ensures that consumers can timely and accurately inform themselves of various product and packaging issues. However, with more than 400 environmental labels that exist today, this large number of symbols represents a problem when it comes to understanding the environmental performance of products. The aim of this work is to determine whether and to what extent Serbian consumers recognize the ecological symbols on products and packaging. The results of the survey conducted in 2013 in Pancevo and Belgrade indicated that Serbian consumers do not pay enough attention to the environmental labelling of products and packaging and not sufficiently familiar with the most commonly presented eco-symbols. There is a need to educate consumers in the area of identification and interpretation of eco-symbols. Manufacturers, government institutions and consumer organizations have to coordinate work in order to raise awareness of Serbian consumers about the importance of environmental labels.



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**Cross border economic inequalities, interactions and regional integration: the Francistown-Plumtree interface**

Inocent MOYO (South Africa)

The volume and traffic of economic activities in time and space across the Ramokgwebana border post which 'separates' Botswana and Zimbabwe suggests that markets have the potential of exploiting the economic and social inequalities of people, resulting in the movement of people and goods to where there is potential for gain and economic and personal advancement. Therefore, based on in-depth interviews of Zimbabweans who are involved in the cross border activities between Francistown and Plumtree, this paper argues that such activities undermine the effect of the border. The result is that several shops in the Zimbabwean border town of Plumtree actually buy their goods in Francistown, Botswana and resale them in Plumtree, Zimbabwe such that there is a de facto connection between Zimbabwean shops and the wholesalers in Francistown. In a region like the SADC which aim to integrate among others the economic actvities, the interface between Francistown and Plumtree, is a grassroots activity which can be harnessed to achieve such an aim. Key words: Cross border social and economic activities, regional integration, SADC



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**Analysis of Israel interaction with countries of the region and examination of opportunities and threats after 2000**

Abedin GHASEMIAN (Iran)

Israel Territoriality created an entangled knot between Israel and Palestinians, and with other countries in the Middle East and North Africa. The purpose of this article is research of Israel opportunities and threats in the region after 2000.and it has a main question: how is Israel interaction with other countries in this region? We try to make a quantitative research, and define and examine some indexes. It was appeared that political legitimating, security, economic relations, strong Iran, energy, neighbours and...are important cases in Israel destiny. Passing of accepted necessaries in international relations with US support, and long time planning for increasingly global power possessing, made the Israel as special country, in this manner It has obviously made some tensions with its main supporter, however they are superficial. Quantitative of indexes helped to distinguish a process, and future forecasting. Because knowing of behaviour with Israel has become the fundamental problem for some countries in this region.



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**International struggle against nuclear terrorism: political and geographical aspects**

Arseny GUSAKOVSKY (Russian Federation)

The aim of this presentation is to raise the question of nuclear terrorism and to outline the possible ways of solving this problem. Nuclear terrorism which implies acquiring technologies in order to produce nuclear bombs or attacking nuclear power stations with the aim of destabilization of the situation is one of the most dangerous phenomena in the contemporary world. Russia and the USA having a great experience in the field of atomic developments may be regarded as the most influential countries in terms of solving the problem of nuclear terrorism. Both countries put forward a great number of proposals to reduce the threat of spreading nuclear weapons which are accepted by the partners. However there are a lot of contradictions as well which should be eliminated within the framework of either bilateral negotiations or international cooperation in the margins of United Nations and International Atomic Energy Agency.



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**Towards a single African economic space: informal cross-border traders and the COMESA-EAC-SADC tripartite free trade area negotiations**

Christopher C. NSHIMBI (South Africa)

This paper interrogates the position of informal cross-border traders (ICBTs) in Africa's economic integration agenda, with a specific focus on eastern and southern Africa. The African Union (AU) envisages an African Economic Community (AEC) by 2028 and has, therefore, identified eight African regional economic communities (RECs) to build the AEC. One of the eight RECs, the Southern African Development Community (SADC), has established the fundamental conditions for a free trade area (FTA) à la neoliberal regional economic integration theory. In a boost to the AU's continental integration agenda, SADC is currently engaging two of the eight RECs the AU has identified to build the AEC—the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC)—in a bid to establish a COMESA-EAC-SADC tripartite FTA (CTFTA). Despite the progress in the CTFTA negotiations among the three RECs, existing SADC legislations and the CTFTA negotiations apparently ignore the reality of informal cross-border movement and trade in the regions. Secondary and primary sources, including a thorough review of relevant legislations and interviews with key policy makers and ICBTs provide data for examination against research objectives.



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## The Importance of Aarhus Convention implementation for Developing Countries

Larisa JOVANOVIC, Slavko VUKŠA (Serbia)

Based on the concept of "sustainable development" and its practical application in the developing countries and in our country too, the Aarhus Convention and its application contributes to the protection of rights of all people, of the present and future generations, to live in the environment that is appropriate to their health and well-being. The Aarhus Convention is the Convention on access to information, public participation in decision-making and access to justice in environmental matters. The Convention was signed by 38 countries in Aarhus, Denmark, 1998, at the 4th Conference of Ministers of Environment of the European countries. The adoption of the Aarhus Convention (2009) is of great importance for the Republic of Serbia, especially in the process of EU integration. In order to implement the ratified Aarhus Convention the Republic of Serbia has the obligation to initiate the process of "environmental" laws acquiring, which was enacted in 2000-2014 firmly relies on the Aarhus Convention. The aim of this work is the promotion of the Aarhus Convention postulates with the purpose of environmental protection and sustainable development. The research on public awareness about the postulates of the Aarhus Convention was conducted by surveys of students and employees in various institutions. The statistical analysis of the survey data showed a very small percentage public awareness (from 3 to 29%). It is essential to organize more frequent thematic meetings, conferences, round tables and other forms of dissemination of knowledge about the necessity of public participation in environmental protection.



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**The Israel - Syria border - a hundered years of unsolved boundary**

Gideon BIGER (Israel)

The boundary between Syria and Israel was first dealt during World War I, in 1916, as part of an agreement between France and Beitain. Later, after 5 years of dicussions, a boundary line was established between french syria and British Palestine, This line held for only 25 years, when, after Syria became an independent state and the State of Israel was established on part of British Palestine, three wars and lots of skirmishs took place along this line, which up to now no fixed boundary line exsits between there two countries. the paper will deal with this unusual phenomena.



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**Political geographies of Urban Multilingualism: An exploration of Linguistic Mental Maps of Amsterdam**

Virginie MAMADOUH, Nesrin El AYADI (The Netherlands)

This paper first discusses academic representations of urban linguistic diversity such as the representation of the city as a meeting point of cultures and languages, either a cosmopolitan inclusive harbour of diversity (the ideal city?) or an exclusive arena where language groups compete for the control of territory, and the representation of (ethnic) neighbourhoods as enclaves characterized by a specific, deviant linguistic landscape and a concentration of linguistically different inhabitants. It then discusses the situation of the city of Amsterdam, which is poorly documented as no language data is collected in administrative registers and there is no census. It presents an empirical study of the perception and the representation of the linguistic diversity of Amsterdam based on a survey among visitors of a festival celebrating multilingualism. Visitors were asked to name languages they thought were spoken much in the city and to identify the neighbourhoods on the map of Amsterdam where they thought these where mostly prevalent. Through these mental maps we examine the geographical knowledge and the perception that these visitors have of the ethnic and the linguistic composition of the different parts of Amsterdam. Hence, the study focusses on how people imagine and perceive the ethnic and linguistic diversity of the capital of the Netherlands and how they link it to specific neighbourhoods. As we shall see it also touches upon stereotypical imaginations of language, place and identity. as these representations are partly rooted in daily experience and partly in popular culture and media discourses.



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**De-Russianization of the Western Post-Soviet Space: Between the Thick and Thin Nationalising Processes**

Petr DOSTÁL, Libor JELEN (Czech Republic)

The paper highlights contextual impacts of the de-Russianisation process in the western post-soviet space formed by three restored and three new nation-states. The de-Russianisation process indicates that in the territorial configuration of this geopolitical zone of Europe the numbers of Russians are decreasing. The key question considered in this paper is whether the de-Russianisation and ethno-political mobilisation processes Russophone population segments seem to contribute to stabilisation or destabilisation of the multi-ethnic societies and their nation-states concerned. This general question is answered by focused considerations of three specific questions: (i) what re-identification tendencies characterise the formation of an assimilating middle group of identities between the Russian identity and titular identities, (ii) in what ways specified re-identifications tendencies seemingly support or weaken nation-state consolidations in the six countries involved and, (iii) whether articulations of ethno-political interests sustain the multi-ethnic state consolidation processes based upon civic political nation conceptions or whether Russian ethnicity-based parties complicate necessary nation-state consolidation processes. Considering the Latvian party system from the interethnic competition perspective, Russian and Latvian ethnic groups are viewed as communities of solidarity fragmenting the society along the ethno-political cleavages. It is also argued that current violent conflicts in the Donbas territory of the Ukrainian nation-state indicate an important unsuccessful nation-state consolidation process and underline the significance of ethno-political mobilisation tendencies which there occur in very unfortunate circumstances of an insufficiently developed party system formation. The specified de-Russianisation tendencies evolve in the geopolitical zone of Europe between the European Union (EU) and Russian Federation and create a differentiated context of changing political, geo-cultural and geo-economic relationships which are developing since the breakdown of the USSR. Given greater likelihood of weak state consolidation processes taking place in Ukraine, possibly also in future Belarus, but also in current Latvia, it is argued that further and more intensive research on this European geopolitical zone would be rewarding and would have to be concerned with differences in evolving national party systems, as those differences change under the impacts of a variety of geopolitical processes.



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**Economic and Political Factors in the Clean Energy Question**

Gianfranco BATTISTI (Italy)

Besides the physical problems (climate change and its origins) in the last decades global warming has become one of the leading questions in the international arena. It has gained a stable audience in the cultural and political debate, especially on the media. Addressing the community of nations, it has undoubtedly reached the dignity of a major geopolitical issue. Of great importance are its economic dimensions, as regards typology, price, accessibility, and geographical distribution of energy sources. Rather surprisingly, with the exception of a quantity of microeconomic calculations, the geoeconomic side of the affair is currently maintained almost as a covered issue. On the contrary, it plays a key role in the balance of costs and benefits to be taken into account by policy makers at national levels. International agreements such as that of Kyoto offer the leading powers an easy way to discipline their allied and client states, in order to obtain other, far reaching, political goals. On the other side, the decisions to privilege or put certain energies off-limits give a direct result in economic terms for selected industries and companies, at the same time paving the way for the establishing of more favourable/unfavourable industrial equilibria on future markets. The paper highlights the intertwining of political and economic issues of energy policies promoted by the Kyoto agreements both from the American and the European point of view.



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**Centenary Evolution of Kurdish Geopolitics**

Nurettin ÖZGEN (Turkey)

In the 19th century, Nationalist movement spread all over the world from Europe also led Ottoman Empire to lose ground and afterwards caused the collapse. With the decline of the Empire, many states were made up/established in the Middle East, which is very rich in energy sources. The Republic of Iraq, founded by the British is one of those states. Kurds who did not swear allegiance to such "made- up" state proclaimed the Kingdom of Kurdistan under the leadership of Mahmut Berzenci (1921). Kurds who could not find sufficient support during cyclical, political atmosphere of the period were bloodily suppressed by the British (1924). Red Kurdistan, which was founded in 1923 and had an autonomous government, was vacated by Stalin in 1929. While it was considered that the struggle of Kurdish political structuring ended, Republic of Mahabad was founded by Qazi Muhammad in Rojhilat (Western Iran), in 1946. Nevertheless, a year later, this country vanished too as a consequence of withdrawn support of Russia and the bloody operation of Shah Reza (Iran) Government. These two movements were under political leadership of KDP (Kurdish Democratic Party) representing the conservative Kurdish identity. Besides such political structures in Iraq and Iran, the socialist-left-wing Kurdistan Workers' Party (PKK), established in 1978 and Kurdistan Union Party (PYD, 2003), which was established with the same political line have built Kurdish identity over the left-wing political (Marxist) structure. Through this structuring, by means of three cantons declared in Rojava (North Syria), a new political structuring has built both in the history of Kurds and that of the Middle East. In recent years, Kurdish forces have attracted the attention of the whole world with their successful defense in various fronts, especially in Rojava against terrorist attacks of various radical Islamic groups arisen out of Arab revolts and this circumstance also enabled a significant legitimacy for Kurdish political movement. Military success shown against radical organizations, especially against Islamic State of Iraq and the Levant (ISIL), is regarded as a significant political gain in the political arena of the West. In this study, predictions have been made for the future on the basis of existing structure by evaluating geopolitical evolution of the mainstream Kurdish political movements in the last century and political positions that they have produced depending upon the political conjuncture of world.



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**Political and geographical importance of Dagestan as a Russian outpost in the Caucasus**

Sh. M ALIEV (Russian Federation)

During the last centuries the political stability of the Caucasus region were defined by the development strategy of Persian, Turkish and Russian states. For the realization of this strategy Russia has paid and pays a huge price. Though joining the Caucasus to Russia has allowed to reduce the local political, ethnic and economic fragmentation, however, over the last two centuries its political map is changed many times. Years of reorganization led to the emergence in the Caucasus of three independent states – Georgia, Armenia and Azerbaijan. The war between Armenia and Azerbaijan over Nagorno-Karabakh maintaining a high degree of tension in the Georgian-South-Ossetian and Georgian-Abkhaz conflicts, two Chechen wars, the continuing conflict between North Ossetia and Ingushetia - all this makes the geopolitics of the Caucasus is very fragile. There is obvious an impossibility of achievement of "historical justice" which would suit all Caucasian republics in the conduct of state border lines. However there is also very encouraging historical example: despite the many contradictions and mutual claims Europeans could unite. We consider that the central role in the Caucasus region at the moment play Russia and Azerbaijan. Both of these countries compete among themselves to existing and proposed transport projects. The degree of penetration into the Caucasus extraregional actors will depend on the level of cooperation of Russia and Azerbaijan in the geopolitical and geo-economic questions. Geopolitical position of Dagestan in the Caucasus is unique. Its territory occupies most of the Russian Caucasus and 76% of the length of the Russian coast of the Caspian Sea. Dagestan is characterized by deep historical and cultural ties with the east and west, north and south. It is considered the key republic of the Caucasian region as Dagestan is capable to influence process of strengthening of Russia's positions in the region. Thus, Dagestan able to play a decisive role in the dissemination of geo-economic and geopolitical influence of Russia on Azerbaijan, Georgia and then on the Arab and Central Asian States. Benefits of a transport geographical position of Dagestan have special value: nonfreezing seaport, road, rail line, main power lines, etc.



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## The Spectrum of Chinese Political Geography

Yungang LIU, Ning AN (China)

This article elucidates the current developments of political geographies in China based on a critical review of the key essays in both Chinese and non-Chinese contexts. Setting up a theoretical background with the existing Anglophone works on political geographies, this paper attempts to understand the advance and response of political geographies in China to the wider literatures. The main arguments of this review sketch out the main political thoughts that have great impacts on Chinese political geographies, including the endogenous 'strategy doctrine' and the exogenous geopolitics and regional geography that links the geography with state administration, border defense, and foreign policy. On this basis, we portray a three-period development of Chinese political geographies since the establishment of People's Republic of China: (1) the stagnant period (from 1949 to the late 1980s). During this period, political geographies were considered as 'pseudoscience' in China; (2) I call the second period from late 1980s to the beginning of the 21st century as the revival period. Since then, the knowledge system of Chinese political geographies has gradually created; and (3) after the new century, Chinese political geographies have experienced the internationalized period in which the Western political geographies theories and methodologies were widely introduced to Chinese scholars. Brief introductions of the key Chinese political geographers and their works make up the final section of the main body of my arguments. In the concluding section, this review points out the future directions of the studies on political geographies in China and tries to answer the questions of whether political geography can be recognized as an independent school of geographical studies in China and what are the key agencies of political geographies in China.



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**Methods of studying the geography of political preferences of the US population**

Peter VARYUSHIN (Russian Federation)

During the 20 th century several groups of methods were used to study the territorial variability of political preferences in the United States. Descriptive methods were at the origins of this research but they are often subjective. Cartographic methods allow representing the interconnections of phenomena, but their application is rather time-consuming, particularly for the large-scale investigations. The use of mathematical methods was a breakthrough in the electoral geography making it possible to parameterize the results of research and make them more objective. At the same time these methods are highly dependent on statistical data quality and often do not reflect the whole situation. However integration of methods belonging to different groups allows creating rather clear representation of processes occurring in the electoral geography of a country or a region. Despite some limitations, the main one being the two-party system, untypical for most countries of the world, the experience of studying the US political landscape could be useful for the studies of political geography in other states.



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**Eurasian multiregional system: factors and tendencies of regionalization**

V.KALEDIN, N.KALEDIN, S.KULIK, R.AMBURTSEV (Russian Federation)

N.Kaledin, V.Kaledin, S.Kulik, R.Amburtsev Eurasian multiregional system: factors and tendencies of regionalization Modern Eurasian multiregional system consists of dozens of regions and borders of different kind and geospatial scale, both of "de jure" and "de facto" by organizational forms. As a kind of "matryoshka of regionalization" it developed at the crossroads of Europe and Asia in interaction between different civilizations, peoples and states in the course of more than four centuries. As a regional geopolitical system "de jure" it has passed four historical geopolitical epochs: Pre-imperial, Imperial , Soviet and Post-Soviet. There was historically increasing tendency of internal regionalization of the region. Factors and tendencies of regionalization of post-Soviet space determined four level structure of this process : international , sub-regional, intra-regional and internal (country) level. International level is manifested in inter-country regional communities "de jure" — unions, organizations, «euro-regions», ets. Dominant geopolitical vectors of regionalization are European (Euro-centric), Eurasian (Russia-centric), Asiatic (polycentric) and the Arctic one. From the point of view of the "de facto" regionalization factors the sub-regional level of regionalization in four sub-regions is also evident ( Euro-Baltic, Baltic-Black Sea, Central-Asian, the Caucasus). Internal (within the sub-regions) ethno-cultural, civilization, social, economic and political differences and similarities of these countries, their differences and preferences allow to distinguish one more fractional level of regionalization "de facto" — intra-sub regional (specific groups of countries). Intra-country level of regionalization (both "de facto" and "de jure") takes various forms: state-administrative, ethno-cultural, geopolitical, civilization, politico-geographical etc. Clear examples: Russia, Ukraine, Kyrgyzstan, Moldova, Tajikistan, Azerbaijan.



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# The Characteristics, Position and Development of the Russian Minority in the former Soviet Countries

Michaela UCHOČOVÁ (Czech Republic)

The number of Russians living outside their home country has increased significantly with the dissolution of the Soviet Union. Millions of Russians have suddenly become strangers, separated from their homeland by state borders. Currently, the Russian minority is one of the largest ethnic communities living outside their home country and, therefore, it represents an issue that must be dealt with both, by Russian government and the governments of the countries with sizeable Russian minorities. The subject of the present paper is to characterize the Russian minority in former Soviet countries and analyse its status and development after the collapse of the Soviet Union. The aim is to evaluate the relationships between individual minorities and their host-states and also between those minorities and Russia using a case-study research method. This article tries to find out whether Russian minorities have the potential to threaten the territorial integrity of their host-countries or whether it is possible that the fact of their presence in the foreign territory could be used by the government of Russian Federation to intervene in internal affairs of the countries in its near-abroad and, finally, what discriminatory restrictions, if any, Russians face in their host-countries. The contribution of the given research can be seen in introducing a comparative analysis of the Russian minority in the post-Soviet space, its reflection in international relations and security in this area, thus offering a view to the future based on the study of legal acts, sociological researches, relevant media and related professional literature.



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**Geopolitical position as a factor in the development of Russia's foreign trade**

Alexey URZHOMOV (Russian Federation)

The second decade of the XXI century darkened aggravation of a number of regional conflicts and the rise of global tensions. This in turn led to some changes in the geography of world trade. The most important changes are caused primarily "war of sanctions" between Russia and NATO countries. In this situation the parties to the conflict need to search for new markets and new partners to supply the missing items. Everything you need can be provided by countries in Asia and especially China, although some costs in mind the geographical remoteness of the region. To resolve this problem, operational measures of the Russian government, as Western countries the volume of trade with the opponent is not critical. Progress in this direction, we can see in regular mutual visits of leaders of Russia and China. Even more significant changes are waiting for the Russian-Ukrainian trade volumes are likely to be reduced and the structure will undergo changes. The interaction of all these factors can lead to a redirection of Russia's foreign trade with the West to the East, and at the same time and all the geopolitical interests.



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**Kazakhstan: the territory of the collision of geopolitical interests of Russia and China**

Alexey URZHOMOV (Russian Federation)

In 2014 seriously changed the world political situation, accompanied by the growth of international tension. In the current geopolitical situation, the most important ally of Russia Federation remains the Republic of China. Strengthening of friendship were the prisoners of the contract on the supply of natural gas and modern weapons systems. Nevertheless, on the world map, there are regions where the public interest of the two countries intersect and come into direct competition. This place - Central Asia, namely Kazakhstan. Young Central Asian state was sandwiched between the two world leaders. On the face of clear competitive advantages from such a geographic location, but a clash of interests such serious players may lead to an increase of tension in the region. To date, Kazakhstan is a leader among the Central Asian states, it can be called a regional leader. Russia remains an important trading partner of Kazakhstan. Recently passed in the form of co-operation of the Customs Union. A significant factor in the modern interaction between the two countries is the presence in the Republic of Kazakhstan Russian ethnic minority which is more than 20% of the population. At the same time rapidly developing China actively captures markets in Central Asia and has the largest increase in the volume of trade with the region, especially with Kazakhstan. This is especially important for economic interaction of Xinjiang Uygur Autonomous Region of China, the most politically unstable margin People's Republic, with a population of 2 million. Kazakhs - 7% of the population of the province. In recent years, China surpasses Russia in terms of foreign direct investment in Kazakhstan, which significantly affect the balance of power in the region. Taken together the conflicting interests of the two countries.



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**Disparities of economic development Post-soviet states**

Dmitriy ZAYATS (Russian Federation)

The authors analyze the length of new frontiers in the total length of the boundaries of the Post-soviet countries and the degree of modern economic development of the region, changes in economic development since the collapse of the Soviet Union, the magnitude of the differences and gradients in the new state borders in Post-soviet countries. The collapse of the Soviet Union has affected most negatively in Ukraine, Kyrgyzstan, Tajikistan and the South Caucasus. Kazakhstan and Turkmenistan win in economic terms from the collapse of the USSR. The authors consider the tendency of putting Russia's position in almost all Post-soviet countries and attempts to create a new wave of economic and political integration within the new established Eurasian Economic Union.



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**Historical and geographical position of the Western border of Russia**

Dariya ZORINA (Russian Federation)

The Western border of Russia is the result of the development of geopolitically heterogeneous region for several centuries. The size of a drift of Western border's space are hundreds of thousands square kilometers. The entropy is an important property of boundary, the entropy is increasing along the time. There is the classification of modern and historical boundaries, which are located to the West of the center of Russia, in this study.



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# C12.34 Population Geography

## Interactions between human processes, population changes and the environment

**Chairperson(s):** *Daniel ERVIN, David LOPEZ-CARR*

- Growth, Partnership and Conflict: A Study in Select Town Slum Pockets of Assam, India

  *Mahfuza RAHMAN, Pranamika DAS (India)*

- The relationship between land- use and land-cover change and migration processes in Mexico

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- The impact of soil erosion on human migration in China

  *Hua ZHAN, Li ZHUANG, Hong-rui WANG, Jin-she LIANG (China (Beijing))*

- The Influence of Climate Variability on Internal Migration Flows in South Africa

  *Marina MASTRORILLO, Rachel LICKER, Pratikshya BOHRA-MISHRA, Giorgio FAGIOLO, Lyndon ESTES, Michael OPPENHEIMER (United States of America)*

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- Distinctive features of Chinese Diaspora formation and distribution in the USA

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- Skilled migration from Southern Europe in Mexico

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- Immigration and Crimes in Oil Producing Countries , United Arab Emirates A Model

  *Fayez ELESSAWY (United Arab Emirates)*

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- Settlement pattern of immigrants as a factor of social stratification in the European capitals



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- Typology of population dynamics in the Asian part of Russia in the years 1991-2010
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  *Huimin DU (China)*

- Migration influence on the population density of border area (Kursk region)

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- Status of women migration in Indian mega cities

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- Gender Impact Assessment Of Bangladesh Climate Change Adaptation And Mitigation Policies

  *Mahin Al NAHIAN, Sujit Kumar BALA (Bangladesh)*

- Who migrates? Analysing households' migration decision-making process through "gendered geographies of power"

  *Choon Yen KHOO, Maria PLATT, Brenda S.A. YEOH (Singapore)*



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**Geographies of International Student Mobility II: The Roles of Immigration Policies, Universities and Recruitment Agencies 1**

**Chairperson(s):** *Yvonne RIANO, Darren SMITH*

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- Governments, universities and international student migration: the Canadian picture

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- International mobility of Brazilian Students to Portugal: the role of the Brazilian government and University Strategies in Portugal

  *Maria Lucinda FONSECA, Juliana IORIO (Spain)*

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  *Wei LI, Wan YU, Shengnan ZHAO, Xiaojie LI (United States of America)*

- Global Student Mobility – a Narrative of Modernity under the Logic of Core and Periphery

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## POSTER EXHIBITION

- Student Mobility Towards the Land of Confucius, the invisible trend
  *Hans SEESAGHUR (Mauritius)*
- Demographic change and farmland holdings in a rural village of Laos
  *Satoshi YOKOYAMA (Japan)*
- Transnational labor migration and family planning in a rural village of Laos
  *Chihiro SHIRAKAWA (Japan)*
- Population growth and transnational migration to Thailand in a rural village in Laos
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- Demographic atlas of Slovak republic. A cartographic view on 25 years of post-socialistic demographic transformation and spatial differentiation
  *Branislav BLEHA, Boris VAŇO (Slovakia)*
- Global Economy, Local Landscape: Study on the Ethnic Economy of Japanese Expatriates in Guangzhou City
  *Yungang LIU, Yue CHEN, Wenting ZHOU (China)*
- The Study on the new generation of migrant workers' migration desire based on hierarchy theory of needs: a case study of Suzhou
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- Socio-geographic aspects of the "Gypsy question" in France
  *Alina KHUSAINOVA (Russian Federation)*



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**Growth, Partnership and Conflict: A Study in Select Town Slum Pockets of Assam, India**

*Mahfuza RAHMAN, Pranamika DAS (India)*

Urbanization is a process experienced in economically advanced as well as developing countries. Cities and towns are centres of agglomeration, with fast economic growth and tertiary job opportunities. During the last century, rapid urbanization has been one of the most crucial socio-economic changes of our societies. But even where urbanization is still low, people are moving to towns and cities. This rapid urban growth has generated a wide array of socio-economic and environmental problems of which slum areas in many senses have become physical manifestation. People continue to migrate to cities and towns and attract new residents on the basis of push-pull factors, despite wretched urban living conditions for many. Assam is a state in Northeast India, where we do see growth propelling the clustering of people that builds partnerships and the associated problems together with conflicts. Both secondary and primary data have been used where the study focuses on the internal structure, composition, services rendered, assimilation and conflicts of the slum dwellers in Tinsukia and Makum towns of Assam, India. Key words: Towns,Slums, services, conflicts, assimilation,



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**The relationship between land- use and land-cover change and migration processes in Mexico**

*Daniel ERVIN, Fernando RIOSMENA, Sadie RYAN SIMONOVICH, David LOPEZ-CARR (United States of America)*

A large body of research has demonstrated the impacts of rural in-migration on land- use and land-cover change (LUCC), especially in tropical frontiers. However, despite ample anecdotal and case study evidence, very little research using multi-temporal and multi-scale quantitative data has examined the converse question: Is out-migration related to land use cover change in origin areas? This project uses satellite and census data to examine the potential effects of Mexican emigration to the US on Mexican land cover change at the municipal level from 2001-2010. Using a multi-level regression analysis, controlling for a host of household and municipal socio-economic, ecological, and demographic (including other migration process) indicators, preliminary results suggest a statistically significant trend nationally belied by diverse regional trends. Results have important implications for research and policy on international migration, conservation, LUCC, development, and capital/labor flows.



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## The impact of soil erosion on human migration in China

*Hua ZHAN, Li ZHUANG, Hong-rui WANG, Jin-she LIANG (China (Beijing))*

The impact of environmental change on human migration has been widely paid attention in recent years. However, there are still many problems that remain arguable and need to be resolved. Mass human migration has been a significant social phenomenon in China, while soil erosion is a major environmental problem that impacts socio-economic sustainable development. This study is aimed to identify the impact of soil erosion on human migration in China at the county level by analyzing related data. Results of spatial overlay could not identify an obvious relationship between soil erosion and net out-migration in China. We modified the gravity model of human migration to isolate soil erosion from other factors. The estimate results indicate that only serious soil erosion could increase the possibility of migration, and the impact is way higher in agricultural counties than in non-agricultural counties. In general, the impact of soil erosion on human migration is far less than the impact of socio-economic factors.



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**The Influence of Climate Variability on Internal Migration Flows in South Africa**

*Marina MASTRORILLO, Rachel LICKER, Pratikshya BOHRA-MISHRA, Giorgio FAGIOLO, Lyndon ESTES, Michael OPPENHEIMER (United States of America)*

Climate variability has been recently recognized as one of the possible drivers of human migration. Research suggests that migration can be induced as a direct response to climatic conditions, such as changes in mean temperature or precipitation or extreme events; or it can be mediated by a variety of social and economic factors, among them changes in agricultural output and income. This work explores the foregoing issues for the case of internal migration in post-apartheid South Africa. We focus on South Africa as it is a country with significant levels of internal migration and with widespread and relevant temperature and precipitation changes projected for the 21st century. Furthermore, high poverty rates and high levels of rainfed, smallholder agriculture leave large portions of South Africa's population base vulnerable to climate variability. We utilize two complementary statistical models - one gravity-based model (macro-level), driven by national census statistics, and one event-history model (micro-level), driven by individual and household level survey data from National Income Dynamics Study (NIDS). In both models, we explore the effect of climate on migration using climate data from African Flood and Drought Monitor. We find a consistent direct impact of climate on migration, which is strongest for black and poor people. Furthermore, we show that the effect of climate is stronger in provinces more oriented towards agriculture. We interpret our results as evidence in favor of the existence of a possible agricultural channel in the climate-migration link. Finally, we offer insights into the utility of micro and macro level approaches in the study of climate change and human migration.



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**Changes of rural settlement in Russia at the end of the XX – begining of the XXI centuries**

*Sergey SAFRONOV, Alexander ALEKSEEV (Russian Federation)*

Work is based on materials of population censuses in 1970, 1989 and 2010 and considers the dynamics of the rural population density and population size of rural settlements in the late Soviet and post-Soviet periods by regions of Russia. The general trend in the evolution of Russian rural settlement – reducing the number of rural people on the background of their concentration in larger villages – in different parts of the country are not implemented at the same time and in combination with various specific transformation of network structure on population size of settlements. Gradual reduction of the entire network with a slow decrease in the average population size occurs in relatively prosperous regions of the forest-steppe zone. A sharp reduction in settlement network is typical for areas Non-chernozem zone with fewer medium-sized settlements because of their transformation in small settlements and disappearance. These processes began in the Soviet period, mainly under the influence of external factors, primarily the development of urbanization. In the post-Soviet period internal factors have become more important – many rural communities have lost their agrarian base in the form of collective farms.



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**Distinctive features of Chinese Diaspora formation and distribution in the USA**

*Anastasia SHCHEPINOVA (Russian Federation)*

Chinese diaspora is considered to be the largest diaspora in the world and comprises from 35 to 50 million of members by different estimates. Chinese American community of the USA is the largest overseas Chinese community outside of Asia and the largest Asian ethnic group of the country. It numbers approximately 3,3 million people which is 10% of the world's Chinese diaspora and 1,1 % of total population of the USA as of 2010. Chinese diaspora is recognized as both old and new type of diaspora and is justly called "American oldest new diaspora". First Chinese immigrants arrived to the USA West Coast in the early 1820s and were the poorest and the most uneducated laborers. Later the Chinese community became the only ethnic group that was prohibited from entering the country by the law 1882. 3 periods in which Chinese immigration can be divided describes it as a very complicated, various and changing process. Nowadays the Chinese diaspora is more often called "the model minority". This stereotype characterizes Chinese Americans as more highly educated, well-qualified, economically and socially successful than any other racial minority groups. Chinese Americans distinguish from the total population and from each other by a wide variety of social and economic characteristics. The most assimilated, successful and highly educated Chinese Americans live in California that has always been the main center of immigration. New York on the other hand still receives a great number of illegal, poor and uneducated labourers. These two states accommodate more than 65% of all Chinese Americans. Chinatown still exist as a traditional ethnic area but don't serve as a place to born, live, work and survive as it was during first two periods of immigration.



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## Skilled migration from Southern Europe in Mexico

*Cristóbal MENDOZA, Anna ORTIZ-GUITART (Mexico)*

Literature on skilled migration has generally followed brain drain assumptions when analyzing the phenomenon in less developed countries. This literature has also considered mobility within transnational corporations, with developing countries being receivers of technical and managerial staff. Yet this paper demonstrates that skilled migration in Mexico is far more complex, since current stressful economic situations in many Europeans countries have pushed many of their nationals to try to get better work conditions abroad. From evidence on 130 interviews with Spaniards and Italians living in four Mexican cities, the paper analyses (i) the reasons for this collective to choose Mexico, their mobility within labour markets as well as opinions on work place and labour practices, and (ii) perceptions, values and representations of lived spaces and how these may help create a "sense of place" in the four Mexican cities. First results suggest that their labour incorporation is not restricted to transnational corporations, as literature suggests, but it covers a great deal of professionals (e.g. academics, aid workers) who find better work conditions in Mexico. Mobility within highly unregulated Mexican labour markets follows informal channels to which skilled migrants get access after some time in the country. As for the geographical perspective, interviews and mental maps drawn by interviewees suggest that skilled migrants do not develop a clear sense of place, but they have practical everyday uses of the space, generally restricted to their neighbourhood of residence and workplaces.



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**Immigration and Crimes in Oil Producing Countries , United Arab Emirates A Model**

*Fayez ELESSAWY (United Arab Emirates)*

Immigration and Crimes in Oil producing Country , United Arab Emirates A Model Professor Fayez Elessawy Department of Geography and Urban Planning, UAEU ---------- Since the seventies of the twentieth century, the United Arab Emirates has received large numbers of immigrant workers whose presence has drastically changed the demographic characteristics of the country. The need for the foreign workers (mostly Asians) coincided with the recent economic boom, which resulted in the immense oil revenues, invested in colossal projects aimed at building the country's infrastructure. There is not enough local (Emirati) labor force to meet the demands for labor needed in these projects. The United Araba Emirates has to rely on skilled foreign workers from other countries of the world. The proportion of non-nationals has reached 80% of the total population of the country. Despite the great positive role of the immigrants, this situation has led to many problems in the population age and sex structure, and as well brought many serious negative cultural and social consequences especially the increase rate of crimes. The main aim of this study is to analyze the development of crimes and the spatial distribution of different crimes according to the geographical areas of the country, and according to their nationalities. This study will stress on the common and prevailing crimes i.e. money fraud, drugs, physical violence and aggression, and the crime of illegal immigrants. Types of crimes differ from one Emirate to another as a result of its geographical landscape and the percentage of immigrants and the standard of living which differ clearly from one Emirate to other in the United Arab Emirates. On the other hand, types of crime differ from one nationality to the other. The crimes committed by the Asians differ from those committed by Europeans or Americans. At smaller scale, the types of crimes differ according to the region where the immigrant comes from, for example, the crimes of the Russians differ from the Indians or Egyptians. The many other factors affecting immigrants' crimes in the UAE will be discussed.



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**Key Factors for Successful International Migration: A Panel Data Analysis of Indonesia**

*Endang SUGIYARTO, Priya DESHINGKAR (United Kingdom)*

This study examines factors influencing successful international migration by looking at economic and other aspects and linking it with poverty. The poverty impact is also seen by comparing the poverty status of migrants before and after the migration using the Indonesian Family Life Survey (IFLS) panel data. Overall finding shows that international migration reduces poverty incidence by more than 10 percentage points. Of the total migrants, 16% of them are successful in escaping poverty and 10% are failed, while the remaining 74% remain non-poor after migration. The pro-poor migration is positively influenced by higher education level of family members and more experience and stable household (i.e. older and married household head). On the other hand, factors negatively affecting the successful migration are the past poverty, agriculture main source of income, household size, number of secondary school children and productive age family member. Therefore, education and non-agriculture income source are really the driving factors for the successful migrations since other variables are influenced by these two key factors. These findings call for addressing the human capital quality of the migrants and their families that must be combined with supports for migrants and the poor to be able to participate directly in migration to help them escape from poverty. The government needs to better facilitate migration as part of free choice, protect migrants while they are working abroad, and integrate them in the domestic economy on their return.



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IGU2015 – 1989

**Settlement pattern of immigrants as a factor of social stratification in the European capitals**

*Daria SHATILO (Russian Federation)*

World cities, like London, Paris and Moscow, attract many immigrants and they become like a conflict arena for different ethnic and social groups. The study of the conflict causes was the most appropriate after the events in Paris (2005), in Moscow (2010), and in Berlin, Oslo, London (2011), which shown the migrants adaptation ineffectiveness and social and regional differences reduction. However despite this, the immigration inflow continues. In the research ethnosocial stratification was shown in three large capitals of monocentric countries (London, Paris, and Moscow), as well as in Berlin and Madrid, which are not the largest cities (except population) of their countries. The issue of immigrants settling in the Russian cities and its impact is still much less studied. Therefore, the experience of European countries is particularly important for Moscow, especially for migration processes management, negative effects mollification and common indicators of social stratification usage, because at present this problem becomes more obvious that require attention, monitoring and solutions.



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**Real and virtual space: the example of the Polish diaspora in Belgium**

*Daria ELMANOVA (Russian Federation)*

Integration processes of common European space formation, including an increase in immigration mobility, lead, at first glance, to a startling conclusion: the more unified Europe becomes, the more "mosaic" it appears, in other words, a kind of unity of diversity. The entry of new countries into the EU has provoked a large and relatively diverse stream of foreigners to the Western Europe countries, which can be divided into EU officials and other staff: housekeepers, plumbers, janitors etc. The most numerous group of foreigners of Eastern European origin in Belgium is Polish. Poland is the largest country that joined the EU in 2004, both in terms of population and area. The analysis of the Polish diaspora shows the differences between the real and virtual concentration of the population. Modern technologies allow to study not only the placement of certain groups on a certain territory, but also to carry out a comparative analysis of indicators that reflect the actual placement of people in the cells of the administrative-territorial division, and their Internet activity inside the same territorial units. The simplest option is to compare the statistics with the results of the content analysis. This method is gaining in significance for geographical research, if to the requested set of words geographical reference such as the name of a geographical object is added. Thus, we can identify the territorial differentiation of the phenomenon under study. In addition to content analysis, there are also the latest technologies of linguistic analysis available, including taken from the Internet such as program Textométrie, that allows to conduct a case study on the example of the individual data sets.



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**A study on Russian residents' spatial perceptions in Antalya**

*Mustafa ERTURK, Cemali SARI,* İhsan *BULUT, iskender DASDEMİR (Turkey)*

Antalya is one of the leading cities where foreigners seek residency permit most in Turkey. Approximately 100 immigrants reside in this city according to the latest data. The Russian population comprises 70 % of this number. In this study, the Russian residents' spatial perception was investigated, with particular focus on how people feel physically, socially and psychologically by identifying positive and negative effects of the space on their views and perceptions. My main focus was the relationship between Russian population's views on space and their preference to reside in Antalya. The impact of space on people could arise from the natural atmosphere of or its design. Perception and the degree expectations are met could also explain to what extent a space is preferred or not. Russian residents' educational background, age, profession were seen to have an impact on their perceptions of space.



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**Educational and Instructional Problems of Children of Foreign Families living in Antalya**

*Cemali SARI, Mustafa ERTÜRK (Turkey)*

Antalya currently hosts people from 38 countries. From time to time, immigrant residents of Antalya face various issues; one of the most important of which is education. This serious problem arises from either the moving to Antalya or because starting a new family life or adapting to education and instruction in a different environment. The main purpose of this qualitative study, which was conducted at the first private international Russian school in Antalya in 2012-2013 academic year, is to explore the problems immigrant families' children encounter. The data gathered through questionnaire and interviews with 96 (51 M / 45 F) students of Russian origin, living in Antalya. The 17-item questionnaire, which was developed by the researcher, was translated into English and Russian. The questionnaire was given in Turkish, Russian, and English. Semi-structured interviews were given to students and their parents. The findings revealed that students felt comfortable in Turkey. Yet, isolation from their friends in their mother country is the biggest challenge for them. The findings also showed that participants had difficulty in education, academic performance, communication, leaning their own culture and making new friends. Keywords: Immigration, immigrant children, private international Russian school, Antalya



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## Geo-demographic typology of Russian regions

*Gennady FEDOROV (Russian Federation)*

The geo-demography studies connections between the demographic and the other socio-economic components of the region. The key aspect of the study is a geo-demographical typology. There are following typological indicators: general demographic, economic-demographic, socio-demographic, ethno-demographic, ecological-demographic indicators and indicators on the spatial distribution of the population. Using the method of grouping and cluster analysis, we have identified three types of regions, 9 subtypes of the first level and 19 subtypes of the second level. Type I includes well-developed regions of the European part of the country and the south of Western Siberia with a sufficiently high density of population, including rural areas. They are characterized by a low birth rate and high mortality rate, a low number of children and a high proportion of the elderly. The process of aging is not extensive, but it continues to grow. Type II combines the less developed regions of the country with a low population density. Type III includes national republics with a predominance or a high proportion of the ethnic population. All of them have a positive birth rate, the one of a low level is in the Volga region and some of the Eastern republics, and of much higher level are in the North Caucasus as well as the republics of Altai and Tuva. Subtypes differ in rates of natural and migratory movement, in the age structure of the population, urbanization, population density and in living standards. Typological differences of the regions should be considered in the strategic planning of their development and implementation of the regional demographic policy.



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## Typology of population dynamics in the Asian part of Russia in the years 1991-2010

*Tomasz WITES (Poland)*

With the changing world as its backdrop, the Asian part of Russia is a region which due to its isolation resulting from many factors escapes easy assessments. The purpose of this study is to prepare a typology of the population changes in the Asian part of Russia, an area where the population has been declining since 1991. Typology is a stage of the discovery process that most often precedes the observations that, among others, take place during a case study. Typology is creating models, defining the objects of study by indicating the characteristics that comprise the essence of these objects. In this study, a grouping can be considered a typology that concentrates on the growth or decline of the population in Siberia and the Far East. This presentation concerns the results of a statistical analysis of two components of depopulation, movement through migration and the natural growth of population during the period 1991-2010. The basis of the classification method is the premise that real population growth or decline depends on a correlation between the natural population growth or decline and the growth or decline due to migration. The typological squares of the population dynamics were divided into eight sections, in which the data from the element studied were assigned to individual types. Additionally, the presentation introduces several requirements that the correct typology should meet.



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**Recurrent spatial mobilities in Russia**

*Andrey TREYVISH, Pavel KIRILLOV, Alla MAKHROVA, Tatiana NEFEDOVA (Russian Federation)*

Apart of one-way resettlement migration, various types of recurrent mobilities, such as labour migrations (daily commuting and long-term ones), various tourist and shopping journeys etc., and a special sort of seasonal and weekend second-house 'dacha' mobility are common in Russia. Being the World champion in number of summer residences, Russia lags behind the West in terms of corresponding data and research. Commuting is typical for the largest metropolitan areas while the long-term guest workers and domestic 'otkhodniki' migration is much wider geographically. Normally a combination of income, social benefits, and inverse housing prices gradients is responsible for maintaining these strong population flows. Thus, the labour migration rates accurately reflect the levels of spatial Centre-Periphery inequalities at different scales. The reverse dacha mobility from urban areas to countryside for recreational and/or food self-supply reasons is a special focus of the research. Dacha-type mobility comprises nearly every second household in Russia and depends on the city size and surrounding landscapes. The research covers different aspects of dacha mobility: (1) the history of dachas, (2) definitions, consideration or assessments of the phenomenon; (3) the reasons for the social super scales of the Russian dacha; (4) a conclusion with an attempt to specify some types of dachas. Several historical periods in dachas' formation in Russia with different type of buildings and of spatial forms are distinguished.



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**A Comparative Analysis of Skilled and Unskilled Interregional Migration in China, 1995-2005**

*Jianfa SHEN, Ye LIU (China)*

In the age of globalization, skilled migration has become an increasingly important part of migration in contrast to general labor migration in many countries. The spatial patterns and determinants of skilled migration will be different from unskilled migration due to their different origins, human capital and the destination choice. Many quantitative and qualitative studies have been made on internal migration as well as temporary migrants in China. But most previous studies do not distinguish skilled migration from unskilled migration, leaving a significant research gap in the literature. Some important research questions need to be answered regarding the possible difference between skilled and unskilled migrants in China. First, does migration asymmetry exist among both skilled and non-skilled migration? Is there any difference in the extent of asymmetry between two kinds of migration? Second, is the relative emissiveness of skilled migration more evenly distributed than that of unskilled migration? Are the top regions of relative attractiveness for skilled migration different from that of unskilled migration? This paper will conduct a systematic comparative study to reveal different spatial patterns and determinants of skilled and unskilled migration in China using the data from 1% population sampling survey in 2005. The findings have important implications to population distribution and regional development in China.



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**Is overpopulation in late Imperial China a myth?**

*Harry F. LEE (China)*

There is a continuing debate over whether the series of population checks in late imperial China were caused by overpopulation or not. The debate may be rooted in the absence of quantitative estimates of population pressure. In the present study, fine-grained historical socio-economic and population datasets together with statistical methods were utilized to estimate quantitatively the population pressure in China in the period 1730-1910. The possible paths through which population pressure was translated into demographic catastrophes were also examined. Statistical results show that (1) the frequency of various population checks was positively correlated with subsistence pressure, (2) food strain and its associated demographic catastrophes were driven by the synergistic work of climate-induced agricultural shrinkage and population growth, and (3) the synthesis significantly determined population growth dynamics across China at various geographic levels. To conclude, overpopulation in late imperial China is not a myth, and the series of population checks and eventually population collapse were caused by subsistence pressure during the period. When examining historical Chinese demography, the adverse effect of climatic forcing on human carrying capacity should be considered.



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# The multi-locational status of China's floating population and their social protection: Challenges and policy implications

*Yu ZHU, Liyue LIN (China)*

Based on two surveys of the floating population and subsequent in-depth interviews with them, their employers and officials of relevant government departments in Fujian Province of China, this paper examines the multi-locational status of China's floating population and its implications for their social protection in China. It first demonstrates the prevalence of multi-locational status of China's floating population, suggesting that most members of the floating population adopt multi-locational livelihood strategies, with 50% of them being separated from part or all members of their respective nuclear family. The paper then examines the complex and diversified needs of the floating population for social protection arising from such multi-locational status, and the current approach to social protection for them in such a context. The results suggest that the current urban-based approach focusing on the floating population's 'integration into cities' is inadequate to meet the floating population's needs for social protection. The paper also explores the conceptual and policy implications of the above analysis, focusing on the limitations of the conceptual framework of urban inclusion and exclusion in guiding the discussion on social protection for the floating population, and on some practical issues such as the portability of social protection programs and their institutional basis and financing mechanism.



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## Migration, Population Change And Social Conflicts In India

*Anuradha BANERJEE, Chandreyi BANERJEE (India)*

Human migration involves spatial mobility including a change in residence. Though it has been in existence historically, but in the context of globalisation has special significance. Migration induced population change/redistribution arises out of regional disparities and has societal implications. As a consequence of the neo-liberal policies followed by successive Governments in India, there are serious income disparities, agrarian distress, inadequate employment opportunities, vast growth of informal economy and migration particularly from rural areas of less developed states to urban areas of developed states, results in population inflation. Moreover, migration and integration of migrant groups have become contested issues, involving several dimensions. Processes of inclusion / exclusion by host societies are often governed by several factors including complex economic, social, institutional, political / governmental regimes, power structures and knowledge systems. The present study is an effort to capture migration pattern and population change in India and resultant manifestations. Results show that local communities are often pitted against migrants in losing jobs, lowering of average wages, stress on infrastructure and refusal of migrants to adopt local culture. On the other hand, migration is a survival/coping strategy for millions who move to escape poverty and sustain their families back home. Moreover, more developed states owe their success to the contribution by migrant labour. In this context, it is imperative to understand the pattern of such development induced migration, the various issues involving contestations and social conflicts and the way out through policy imperatives.



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**A Tussle of Social Status between Migrants and the Wealthy Non-Migrants of Rural Dinajpur**

*Sudipta SARKAR (India)*

Migrant's experience of a new social status at their place of origin brings a significant change in their own lives as well as in the community. These changes ultimately give rise to several complex situations which has great implications on economic and social scenario. Analysis of Dinajpur's migrants' life stories on one side and a focus group discussion among community's rich non-migrant members reveals a hidden tussle between the rising self respect of migrants and a growing dissatisfaction of the rich community at the origin. The present paper will look into this particular issue of tussle where migrant's economic and social mobility is seen along with wealthy-class's grounds of dissatisfaction. Keywords: Migration, Social Mobility, Economic Mobility, Social Status, West Bengal, Uttar Dinajpur.



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## The Temporal and spatial patterns of the Migrants' Mobility across Cities and Their Gender Difference: Evidence from a Survey in Fujian Province

*Liyue LIN, Yu ZHU (China)*

The migration process in China is not a simple one-step process and usually involves two stages: the initial stage for migrants to leave the place of origin and arrives in the first place of destination, and the subsequent stage for them to move across different cities before their finally settlement. So far most studies have been focused on the first stage and have neglected the subsequent stage, which is nevertheless indispensable for a complete understanding of migration patterns in China. Based on the individual-level event-history data from a random sampling questionnaire survey of 2977 migrants in Fujian Province in 2009, this article examines patterns and characteristics of migrants' mobility across cities in the subsequent stage of their migration. The results show that migrants' mobility across cities is a common and complex phenomenon. Migrants tend to move to places of longer distance and larger cities with the increase in the frequencies of their subsequent migration, and the majority of migrants' movements across cities occur in the early period of their migration career. On gender differences, women migrants are more likely to move to large-sized cities than men migrants, and men migrants tend to move in wider spatial ranges and stay in the destination cities for longer periods of time. All the above suggests that the temporal and spatial patterns of migrant subsequent stage of migration are different from those of the initial stage of migration, and more efforts need to be devoted to reveal them.



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**An investigation into the effect of population dynamics and socio-economic disparities on primary school education: A case of Vhembe District, Limpopo, South Africa**

*Madzinge NEMBUDANI (South Africa)*

Socio-economic disparities within provinces and districts of South Africa have affected the provision of primary schools education in Vhembe District of Limpopo in South Africa. The provision of primary school education is not equal and just. This has affected learner enrolment in primary schools and a number of schools have since 1994 been shut down due to declining enrolments. Vhembe District is situated in one of the poorest provinces of South Africa. Poor economic development accompanied by out-migration and declining fertility have made the situation more complex and these have left some schools with unsustainable learners and hence the closure of some schools. Declining learner enrolments is the reality facing the communities in Vhembe District. Younger and economically active people are continuously moving out of the area. This study investigated the causes of regional disparities and the effect of school closure on communities. To achieve this data was collected from members of the community at household level, educators at schools, and authorities in the Department of Basic Education. Key recommendations include the creation of better opportunities and to adjust the learner educator ratio to match current changes in population.



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**Population Inequality in Hong Kong: from Poverty to Social Exclusion**

*Yefang HUANG (China)*

With the changing world as its backdrop, the Asian part of Russia is a region which due to its isolation resulting from many factors escapes easy assessments. The purpose of this study is to prepare a typology of the population changes in the Asian part of Russia, an area where the population has been declining since 1991. Typology is a stage of the discovery process that most often precedes the observations that, among others, take place during a case study. Typology is creating models, defining the objects of study by indicating the characteristics that comprise the essence of these objects. In this study, a grouping can be considered a typology that concentrates on the growth or decline of the population in Siberia and the Far East. This presentation concerns the results of a statistical analysis of two components of depopulation, movement through migration and the natural growth of population during the period 1991-2010. The basis of the classification method is the premise that real population growth or decline depends on a correlation between the natural population growth or decline and the growth or decline due to migration. The typological squares of the population dynamics were divided into eight sections, in which the data from the element studied were assigned to individual types. Additionally, the presentation introduces several requirements that the correct typology should meet.



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**Spatial Mobility of Educated Young People from Peripheral Areas: The Case of Chaohu, China**

*Huimin DU (China)*

Adopting a native-place perspective and a life-course/biographical approach, this research uses mixed methods to explore the patterns and meanings of migration among educated young adults originating from Chaohu in Anhui Province. Firstly, based on migration trajectories data from a life-history survey, this study analyses the respondents' migration pathways from home to university and onwards to current place of residence, and develops a four-fold typology of spatial mobility(move-down, stick-in, move-up, and re-entry). Secondly, drawing on informants' biographical narratives of mobility, this study identifies different patterns of mobility aspirations among educated young people and explores the interplay between mobility and aspirations. This work makes original contribution to research on the complexity and heterogeneity of migration and therefore challenges traditional work that emphasizes unidirectional moves.



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**Migration influence on the population density of border area (Kursk region)**

*Lyudmila POPKOVA (Russian Federation)*

The research of geographic and regional differentiation of migration data of border region was based on the analysis of its intensity and effectiveness. Nowadays Kursk region as well as most of territorial entities of the RF is considered to be a region where natural population decline goes beyond migration population growth. Alongside with this migrations compensate population decline for more than 1/3. This situation shows the importance of the research.Migration attractiveness of Kursk region directly depends on its natural resources,tolerant attitude of native population towards newly arrived people and absence of inter-ethnic conflicts. The reason for increased attention to the migration policy is great dimension of migration, maldistribution of migrants, undesirable (from the point of view of local residents) significant effects of migration growth at the beginning and especially in the mid 90s. Mechanical demographic development of Kursk region is accompanied by the processes which stimulate the territory irregulation: some territories become underpopulated (out in the sticks) and population concentration is typical for cities and suburbs. Being spontaneous, the process of migration is community-based. Despite of the fact that each relocation is to some extent accidental and in the current context practically uncontrolled, this process should be expected and taken into consideration. In case we know the regulations of population migration we will attempt to influence the nature of migration processes. One of the ways out can be in the revival of the old and creation of the new workplaces.



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**Arctic territories and indigenous peoples: problems of social-demographical development (on the example of Republic of Sakha (Yakutia))**

*T.S. MOSTAKHOVA, A.A. PAKHOMOV, D.V. TUMANOVA (Russian Federation)*

The article analyzes the demographic situation in the Republic of Sakha (Yakutia), including the Arctic regions of the Republic - the territory inhabited by indigenous peoples of the North. the number and sources of population are considered. The problem of premature mortality population are highlighted. The problems of contemporary socioeconomic status of indigenous peoples of the North connected to the development of the traditional industries of the North are considered. Relationship between industrial companies with indigenous peoples of the North is considered. Measures for the improvement of the state policy in relation to indigenous peoples of the North are proposed.



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**Social segregation and integration of migrants in peri-urbanized China: A case study in Dongguan Municipality**

*Shenghe LIU (China)*

Since the reform and opening up, China has undergone rapid urbanization with its urban population increasing from 191 million in 1980 (19%) to 670 million in 2010 (50%). However, this paper argues that China's recent urbanization can only be called "peri-urbanization" because of: a) the large number of floating migrants (220 million or one third of its total urban population); b) the farmers living in peri-urban zones of the cities who still keep their rural lifestyle; and c) the newly developed sprawling cityscape interspersed with mixed rural and urban land use patterns. This study examines in particular the southern coastal areas of China where foreign direct investors have taken advantage of cheap land, labor, low taxes and their proximity to urban markets and international ports. Meeting more than 80% of local labor demand, migrant workers are excluded from local social welfare, social participation and political rights. Massive social exclusion has also led to severe problems of spatial segregation, social inequality, unhealthy urbanization and social instability. Based on the fieldwork studies in Dongguan Municipality conducted in 2002 and 2007, this paper intends to: a) examine the process and characteristics of the economic development and social change taking place over the past three decades in the peri-urban areas of Dongguan Municipality; b) by using sample survey data on 500 migrant workers and local non-migrants, analyze the interactions and mutual acceptance levels between migrants and local residents as well as the perceptions of local residents towards migrant workers; and c) finally explore effective policies or measures to promote the integration of migrants with local rural and urban residents.



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**Status of women migration in Indian mega cities**

*Falguni DEY (India)*

Status of women migration in Indian mega cities Falguni dey Junior Research fellow, Department of Geography, University of Calcutta, India falguni.dey2008@gmail.com This paper attempts to figure out the status of women migration in the selected Indian mega cities. Early migration theories might have revealed the fact of lower trend of long distance migration by the women but the situation has undergone a rapid change in last couple of decades. Despite marriage, this perhaps still continues to be the main reason for the women to migrate; other contributing factors like higher education, employment etc. have turned around the situation in present day India. The study has selected top six Indian mega cities like Mumbai, Kolkata, Delhi, Chennai, Bangalore and Hyderabad which attract huge number of female migrants both at national and international level. The problem is descriptively analysed with the help of census data, suitable statistical techniques and modern GIS software. Migrants basically approach from the peripheral rural districts and eventually disrupt the records of urban sex ratio and demographic pattern, factors like marriage is losing its past records whereas employment and higher education are among the major upcoming causes of migration. Mumbai shows the highest trend of women migration as compared to other cities. Employment as a factor of migration still continues low rate in almost all cities. The present trend and status of women migration draws a greater attention of the Indian planners, geographers, demographers, economists, and sociologists by contributing higher percentage in national income. The record breaking present trend of women migration has undoubtedly made a remarkable change in urban demographic environment. Key words: Women migration, Mega city, Employment, Education



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**Gender Impact Assessment Of Bangladesh Climate Change Adaptation And Mitigation Policies**

*Mahin Al NAHIAN, Sujit Kumar BALA (Bangladesh)*

Bangladesh has been identified as one of the most iconic country to the adverse impact climate change (CC). CC associated adversity and vulnerability is contextual and gender specific. Though the global community has agreed on meaningful gender just CC adaptation but the progress till date is far from satisfaction. Bangladesh is currently leading its CC negotiation and adaptation through Bangladesh Climate Change Strategy and Action Plan (BCCSAP 2009) and National Adaptation Programme of Action (NAPA 2009) that had been globally accepted as very strong step against CC adversity. This study tried to make Gender Impact Assessment (GIA) of these two CC strategies. GIA, a core tool for gender mainstreaming helps to estimate the effects (positive, negative or neutral) of any policy or activity implemented in terms of gender equality; the GIA tool had been applied in the study after collecting in-depth data on gender specific vulnerability in line to the existing gaps between policy formulation and implementation on CC associated grounds. The study had been carried out in cyclone Aila affected Padmapukur union and questionnaire survey and different participatory tools had been used for data collection where women were the primary respondent. From the GIA, Bangladesh's CC adaptation policies were found to be gender exclusive. Thus it pose a threat that, with no to low level of participation and gender exclusive programme implementation, it might increase the existing gender disparity which could resulted into failure of overall intervened activity. From the GIA findings and community recommendations, the study provided few suggestions in line with gender just climate change adaptation and mitigation with 'bottom up-top support' institutional framework for gender mainstreaming.



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## Who migrates? Analysing households' migration decision-making process through "gendered geographies of power"

*Choon Yen KHOO, Maria PLATT, Brenda S.A. YEOH (Singapore)*

In the context of Javanese culture in Indonesia, traditional gender ideals tend to depict men as the legitimate migrants (to both internal and overseas destinations) while women on the move are often considered 'out of place'. However, this male migrant-as-breadwinner household arrangement is complicated by existing gendered migration regimes in Asia which favour women's labour migration, especially to international markets. Unlike men who typically have to accumulate a large sum of money as upfront payment to facilitate their migration, women are often able to access debt-financed migration where they pay back the migration fees in instalments through salary deductions only after they start work. Drawing upon a household survey (N=1,203) and follow-up in-depth interviews conducted with non-migrant households (N=5) and migrants/migrant households where specifically at least one household member is involved in domestic or construction work (N=50) – two low-wage and highly gendered occupations that provide jobs for migrants – we discuss the migration decision-making process within the household through a gender politics lens using Pessar and Mahler's (2003) "gendered geographies of power". Men and women within the household negotiate gender roles and responsibilities, primarily in relation to day-to-day household reproduction and inter-generational family obligations: on the one hand, influencing migration selectivity, specifically who gets to migrate (and who stays behind), and on the other hand, shaping the differential strategies and experience of households and its implication for poverty alleviation.



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**Student Mobility Policies in a Federal System: The Case of Switzerland**

*Yvonne RIAÑO, Annique LOMBARD, Etienne PIGUET (Switzerland)*

The numbers and character of international student migration have changed in Switzerland in recent decades owing to growing global mobility, and the internationalization of higher education. In 2012, 29.2%, of all students enrolled at Swiss institutions of tertiary education had a foreign origin. This is by far the highest percentage of all OECD countries. How can this be explained? To what extent do immigration policies play a role? The question of the role of immigration policies in student mobility is increasingly receiving attention in the scholarly literature. However, so far we don't have a differentiated understanding of the role that immigration policies play in European countries, with different political systems. In particular, little attention has been given to countries with a political federal system, and great numbers of international students, such as Switzerland, where the individual Cantons have much say in terms of education policies. This paper aims to contribute to this research gap. It has two objectives. First, to review the literature on the role of immigration policies on international student mobility and to establish research gaps. Second, to present some first results from an ongoing research project on "Student mobilities to Switzerland" regarding the question of how exemplary cantons implement in practice the policies of international student mobility devised by the federal government.



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## How visible are the "lighthouses"? Elite status of German universities and attractiveness for international students

*Donata BESSEY (Republic of Korea)*

This paper analyzes the effect of a recent university reform on university attractiveness for international students. Germany is one of the most important destination countries for international students worldwide, hosting about 5% of all students studying abroad. The university reform analyzed here is the "German Universities Excellence Initiative" (GUEI) which took place in the years since 2005, is currently scheduled to end in 2017 and had the explicit goal of increasing the visibility of excellent research in Germany. One of the reform's program lines conferred the colloquial status of "elite university" to a small number of selected universities (currently, there are 11 of them). I analyze the effect of the "elite university" status on the numbers of incoming students without a German high school diploma (henceforth "international students") using a differences-in-differences approach and comparing universities who eventually received the "elite" status to those who made it to the final round, but were not awarded the status, as these universities should be of similar quality. Using data on international freshmen students from Wissenschaft Weltoffen for the years between 2001 and 2012 and controlling for a host of university and city characteristics, including information on the number of exchange countries with other universities, if the university charged tuition fees, average rents, scientific staff/student ratio and GDP per capita in the university region, I find a significantly positive effect of the "elite" status on the number of international students. This suggests that the "elite" status indeed increases a university's attractiveness for international students.



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**Governments, universities and international student migration: the Canadian picture**

*Lucia LO (Canada)*

The accelerated pace of globalization and neoliberalization has advanced student mobility as a dominant feature in the current international migration scene. Globalization leads global north countries to proactively recruit international talents to improve/maintain their global economic standing. Neoliberalization downsizes government funding in many sectors, causing higher-education sectors to increasingly seek international students to boost enrollment and revenue. Rapid economic growth in emerging countries produces many newly affluent or middle-class families which increasingly find it easy to send their children aboard for higher education. In these contexts, this paper examines the role governments and universities play in the geographies of international student mobility. A combination of document and data analysis will be used to examine the case in Canada, highlighting the consequences of or the contradictions in such mobility policies/practices.



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## International mobility of Brazilian Students to Portugal: the role of the Brazilian government and University Strategies in Portugal

*Maria Lucinda FONSECA, Juliana IORIO (Spain)*

Brazilian students have long sought Portugal for the pursuit of higher education. However, only in recent years did this flow experience an intense growth (of 109.1% between 2008 and 2012). It is particularly striking that this growth is taking place within an overall framework of declining migration from Brazil to Portugal following the economic crisis and declining labour demand. Both the policies adopted by the Brazilian government to stimulate the international mobility of its students and strategies developed in Portuguese universities to attract Brazilian students have been fundamental in the constitution of this flow. This paper draws on analysis of secondary statistical data, policy documents, interviews with representatives of Portuguese Universities (Lisboa, Coimbra and Porto) and with students to examine the institutional framework put in place to facilitate mobility and the constraints/difficulties faced by students in the process of putting this mobility in place (namely in terms of dealing with immigration bureaucracies, university reception, accommodation, etc).



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**Europe as Unlikely Immigrant Destination: Location Choice for Internationally-Mobile Students in India**

*Metka HERCOG (Switzerland)*

Several European countries have modified their immigration policies to cater specifically to young migrants and students, who are received in host countries as "probationary migrants." With the growing consensus that highly-skilled immigration is desirable for Europe, it is increasingly important to observe how potential migrants perceive Europe and the role that immigration policies play in this process. We compare the perceptions pre-departure Indian students have about certain European countries to the views they hold about traditional, non-European immigration countries. We use survey data collected at Indian universities to assess the students' decision-making regarding plans to move abroad. The results show that while European countries have become relatively appealing for educational purposes, these same countries are not considered attractive for long-term stays. The perception of Europe as a short-term destination reduces the relevance of several changes made to integrate student migration into an overall immigration policy. The mobility patterns of Indian migrants show a persistent dominance of one traditional destination country, and illustrate that migration flows are shaped by factors beyond just immigration policies. The significance of existing networks in choosing migrant destinations calls for fostering cultural exchange between countries, which may prove difficult for countries with limited historical ties.



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**Intellectual migration between the U.S. and China--A Case Study of Chinese Overseas Students in the United States**

*Wei LI, Wan YU, Shengnan ZHAO, Xiaojie LI (United States of America)*

as the result of China's booming economy, studying overseas has seen fast growth over the past decade. Nearly 340,000 Chinese students went to study in a foreign country in 2011 while this number was only around 39,000 in 2000. The U.S. has been the leading destination for Chinese overseas students. In 2011, the number of Chinese students in the U.S. made up 22% of the total study-abroad population of China (Wang, 2012). In the meantime, China has become the top international student source since 2008/09 academic year and sent a total number of 235,597 students in 2012/13 to the U.S.; this is equal to 29% of the entire international student population in the latter (IIE, 2013). As part of an ongoing large-scale research project, our team conducted a comprehensive survey among the Chinese international students who held F-1 student visa and were then enrolled at degree or AECP programs, or holding optional practical training (OPT) status in a public university. Our aim is to examine a wide variety of subjects comprehensively, including socio-demographic characteristics; family background; enrollment, major, and academic performance information; motivation to come to the United States for further study, and specifically to choose their study destination; financial sponsorship; their attitude toward the US-China joint degrees; their assessment of the future of the US and China; their future plan – occupational choice and ideal settlement location, intention to stay in the US/return to China/move to a third country, and the reasoning behind such career aspiration, and also the timeline for decision making. We will highlight some key findings by presenting the summary of statistical results while providing some managerial and administrative implications.



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**Global Student Mobility – a Narrative of Modernity under the Logic of Core and Periphery**

*Stefan KURZMANN (Germany)*

The internationalization of higher education and the raise of international student mobility has become a global imperative. This is also the case in Germany, which has become one of the favored destinations for international students. Although abstaining from high tuition fees, Germany's higher education sector are facing with economization processes and attempts to recruit the world's best brainpower. Own field researches in Central Asia about internationalization and willing international students, going hand and hand with the thesis of prestige as a strong driver of global student mobility (Findlay 2011) as well as with the concept of core and periphery (Chen & Barnett 2000), where e.g. Kazakhstan located as periphery to the semi-core of Germany. Prestige and centrality of universities and host countries are considered as good markers, which reduce the rising complexity of the global supply of higher education. At the same time, they produce a narrative of international education with perceived prestigious cores and huge educational peripheries. The acquirement of "human capital" dominates this narrative of international education which generates dreams and imaginations globally. At the same time, the actual chances to participate in contemporary functional job markets are generated by hard skills, rather than by prestige. These hard skills and professional knowledge are increasingly inclusive and can also be acquired at many higher education facilities in the semi-periphery and at no-name universities.



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**Student Mobility Towards the Land of Confucius, the invisible trend**

*Hans SEESAGHUR (Mauritius)*

In 1978, the number of Chinese students abroad saw an increase, a major policy of Chinese former leader Deng Xiaoping who attached great importance to international student mobility. It helped China in launching developing policies in order to attract international students to China. The recent increase standing of Chinese universities in international rankings and China's rise as the world's largest economy corresponds with an increasing number of international students moving to China. Moreover, the Chinese Government has set up a series of scholarship programmes to sponsor international students to undertake study and research in Chinese universities. These scholarships aim to strengthen mutual understanding and friendship between Chinese students and international students, and to develop cooperation and exchange in politics, economy, culture, education and trade. The traditional flow of students towards English-speaking countries, such as the United Kingdom, United States, Australia and Canada has seen a drastic turning point. The actual top twenty countries with the largest number of students in China are now from the United States, United Kingdom and Canada. This recent sharp increase in the flow of students leveled China as the third most popular destinations for international students. Moreover, the Chinese Government, National Outline for Medium and Long-Term Education Reform and Development (2010–2020), expects the number of international students in China to reach 500,000 by 2020. The increase in mobility of international students across the Chinese borders lead to major changes in immigration policies in order to ease and accommodate the increasing number of students.



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**Demographic change and farmland holdings in a rural village of Laos**

*Satoshi YOKOYAMA (Japan)*

The purpose of this study is to clarify the interrelationship between demographic change and farmland holdings at the household level in a rural village of Laos. Most of the villagers are engaged in rice farming, and gained cash income by selling surplus rice. As of the end of 2014, the study village has 119 households, of which 85 households have paddies. An average paddy holding size per farm household is 28,105 square meters, and the sufficient area of paddy can be secured. In the study area, the inheritance of land is divided equally among the children. In case of increasing population, therefore, the land is inevitably subdivided, and paddy size to support household members cannot be ensured. The study village has adapted the following three strategies to secure necessary paddy area: First, villagers purchase paddies from the neighboring villages. Second, since society of ethnic Lao has a maternal descent system, heiress buys back paddies from men who left the village. Third, villagers develop irrigated paddies to ensure a stable yield. Area of irrigated farmlands in the study village covers as small as 37,567 square meters, so that to cope with paddy shortage caused by land subdividing, villagers purchase paddies from another person including sibling. Most households have at least one member who work temporary in Thailand, and save money. At present about 40 percent of paddies are not acquired by descent but purchased. As a result, food security was achieved by not merely agricultural intensification but temporary transnational migration.



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**Transnational labor migration and family planning in a rural village of Laos**

*Chihiro SHIRAKAWA (Japan)*

This research intends to examine the relationship between transnational temporal labor migration and contraceptive activities among the villagers, particularly women, of Lao PDR. The research village is located approximately 65 km south-east of Savannakhet city and has 119 households as of the end of 2014. All villagers are ethnic Lao. The villagers' livings are highly depending on rice cultivation in unirrigated paddy fields as well as temporal labor migration to Thailand, especially to its capital city Bangkok. The migration started more than 30 years ago. As a result, quite large number of villagers, either men or women, have experiences of working several years in Bangkok. It is speculated that more than half of the young villagers under the age of 35 are currently working there as temporal workers such as sales clerks and small-scale factory laborers. On the other hand, the use of contraceptive majors mainly pills and injections is remarkably popular among the female villagers, particularly those under the age of 45. This tendency now brings fertility decline in the village. Why, and how, has the use of contraceptive majors become so popular? Does this tendency have any relationship with the villagers' labor migration to Bangkok? The research attempts to answer these questions in particular.



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**Population growth and transnational migration to Thailand in a rural village in Laos**

*Shinichi TAKAHASHI (Japan)*

Population growth and transnational migration to Thailand in a rural village in Laos Shinichi TAKAHASHI (Niigata Sangyo University, Japan) PRELIC (Population dynamics, reproduction and livelihood changes in small-scale communities of Laos) Rural Laos has experienced relatively high population growth for long time. Our PRELIC project has investigated the relationship among demographic, economic, and social changes in a village depending on rain-fed paddy production. This study examines why population growth occurred, and how the population growth gave impact on the increase of labor migration to Thailand. Population growth in the village was caused by decline of mortality rates and continuance of high fertility rates. Infant mortality rates declined from over 200 per thousand births of mothers aged 60s to 30-50 per thousand births of them aged 30s. On the other hand, fertility rates of mothers in aged 40s and over have been 5 or more, though these of young mothers are now declining. The village people coping with such population growth firstly adopted to reclaim forests for paddy land. However this almost ended in 1980s, and at the same time paddy land area per farm house decreased. Furthermore, market economy began to penetrate in the village. These changes drove many young villagers to go to Thailand as temporary workers. As a result, they could build new houses and buy paddy lands for living in the village. At the same time migration to Thailand caused to the decline of fertility rates of young married people because they could not have babies during staying in Thailand. Now many young couples plan to have 2 to 3 children and practice birth control.



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## Demographic atlas of Slovak republic. A cartographic view on 25 years of post-socialistic demographic transformation and spatial differentiation

*Branislav BLEHA, Boris VAŇO (Slovakia)*

Faculty of Natural Sciences - Comenius University and Demographic Research Centre, the two leading Slovak institutions dealing with demographic research, have recently published a new Demographic Atlas of Slovak republic. The Atlas represents an original view on the demographic processes and structures within the 25 year of the rapid societal changes. Some very detailed data and methods are presented in the publication using both transversal and cohort demographic approaches. The data from three population censuses 1991, 2001 and 2011 are presented. They cover actually entire period of the post-1989 transformation. This enacts to demonstrate rapid changes in time-space perspective, on the three different levels of the NUTS-III, NUTS-IV and LAU-II units. The maps and graphs discover the very unique spatial patterns of the population development changing over time. The main aim of the contribution is to present major issues and findings and comment several interactions between the regional disparities and demographic differences.



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**Global Economy, Local Landscape: Study on the Ethnic Economy of Japanese Expatriates in Guangzhou City**

*Yungang LIU, Yue CHEN, Wenting ZHOU (China)*

Since the Reform and Opening policy, with the prosperous economy, more and more overseas immigrants, especially high-skilled expatriates from developed countries, come to China fighting for their "Chinese Dream", which has exerted a subtle influence on the economy, society, space and landscape of the host city. This paper intends to examine the ethnic economy Japanese expatriates developed, by means of on-the-spot investigation, questionnaire survey, depth interview and so on. For one thing, it sheds light on the quantity and size of the ethnic economy. For another, trying to find out its distribution in industry, space and some special industry chains is also an important content of the paper. By some case studies, this paper tries to reveal the economic situation and its influence on foreign immigrants in Chinese cities in the new era. The study shows that, with some complete industry chains, the ethnic economy can be characterized as high-end, wider coverage, self-serving and rooted in local. Japanese expatriates in Guangzhou rely extremely on it for their daily needs and they appear to be isolated from the local society. Actually, ethnic economy not only serve for Japanese's daily needs, it also has become a tool for Japanese to maintain their identity, and it has promoted the growth of expatriate CBD in Guangzhou. These changes have brought about new topics for the internationalization of cities and the managements and services for immigrants.



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**The Study on the new generation of migrant workers' migration desire based on hierarchy theory of needs: a case study of Suzhou**

*Qing ZHU, Wenjie SONG, Chenxi YUE, Liang DAI, Yuemei ZHU (China)*

This paper explores how the different demand levels influences the new generation of migrant workers' labor migration desire. The index system is established based on Maslow's hierarchy theory of needs, and GIS spatial analysis, logistic regression analysis and cross-analysis method are used to analyze survey data of the new generation of migrant workers in Suzhou. The result shows that: the influence of the demand level to the migration decisions of new generation workers presents U-shaped distribution. The demand factors of the new generation of migrant workers concerns mostly partial to opposite ends of the demand levels. Similar to the first generation of migrant workers, the lowest level of physiological demand factors (including income, work intensity, living conditions and living standards, etc.) still have a significant impact on the migration decisions of the new generation of migrant workers. At the same time, the self-realization demand at the highest level also has a significant impact on their willingness to migrate. Meanwhile, the impacts of social and respect needs which are in the middle level of needs on the migration decision is not significant.



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**Socio-geographic aspects of the "Gypsy question" in France**

*Alina KHUSAINOVA (Russian Federation)*

Gypsy is the largest ethnic group in Europe. They have not their own statehood. That's why they live in a lot of countries of the world. Their history, culture and way of life are not the same with European once. This is the main cause of the "Gypsy question". " Gypsy question " is a complex of contemporary issues which are related to the Roma ethnic group and their interaction with other people. "Gypsy question" intensified in the West Europe because of the Bulgarian and Romanian entry into the European Union in 2007. However, it was not only the cause of conflicts between migrants and the local population. Also it led to the new problems in European policy of the Roma's integration. The purpose of the research is the study of the geographical aspects and features of the "Gypsy question" in France. The content-analysis method in Google search was used for research of "Gypsy question" which is caused by lack of the data. As a result the areas of interaction Gypsy with local population were detected. During the interviews with the Perpignan citizens the Gypsy's district was detected in the centre of the city. The modern socio-geographical problems of the Roma population in France were detected during the interview of French experts. These problems are the Gypsy's integration into European society, the old prejudices about Gypsies, Gypsy's deportation in Eastern European countries and the regulation of Roma population's movements in accordance with EU legislation. These problems were studied in the temporal and spatial sections.



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# C12.35 Sustainability of Rural Systems

**Globalization and rural sustainability**

**Chairperson(s):** *Doo-Chul KIM; Ana FIRMINO*

- Global Coffee Production, Land Mobility and the End of Zomia in Dak Lak, Vietnam

  *Doo-Chul KIM, Truong Quang HOANG, Young-Kug JOH (Vietnam)*

- The social construction of the quality of tea: challenges and social embeddedness for organic tea in Taiwan

  *Hung Jen TAN (China)*

- Effects of land consolidation on the sustainability of rural community: a comparative case study in traditional agricultural areas of China

  *Yurui LI, Zhi CAO, Yufu CHEN, Hualou LONG (China)*

- Ruralities and Urbanities: spaces of coexistences in small-sized university cities in diverse rural areas of Brazil

  *Wendel Henrique BAUMGARTNER (Brazil)*

## POSTER EXHIBITION

- Analysis of Stakeholders' Networks for the Agricultural Production Space in Awaji Island, Japan

  *Kunimitsu YOSHIDA (Japan)*

- The role of social networks in adapting rural farming systems to climate variability: implications for sustainable agriculture in Pakistan

  *Muhammad ABID (Germany)*

- Fertility Decline and Transnational Mothering in a Rural Village of Laos

  *Futoshi NISHIMOTO (Japan)*



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**Global Coffee Production, Land Mobility and the End of Zomia in Dak Lak, Vietnam**

*Doo-Chul KIM, Truong Quang HOANG, Young-Kug JOH (Vietnam)*

Vietnam is the second-largest coffee exporter in the world. Most of the coffee areas are concentrated in Dak Lak—a province of commercial agricultural production, making up 32.4% of the total coffee area in Vietnam. At present, coffee is the main income source for the province, with coffee accounting for 85% and 40%(2010) of the export value of the province and of the country, respectively. Although the rapid development of Dak Lak's coffee production significantly benefits the province and its coffee planters socioeconomically, emerging urgent problems such as land dispute among ethnic groups need to be addressed. This paper aims to examine how coffee-production development in Dak Lak has affected land mobility and the local governance of indigenous people. In addition, we consider how the livelihoods of indigenous people have changed in the process of increasing land mobility. As a result, it is pointed out that the coffee development in Dak Lak creates the individual ownership on land, transforming the administrative apparatus. This ownership is more and more fortified when the encroaching land of the Kinh immigrants happens impetuously defying the customary law of the ethnic minorities, resulting the end of Zomia.



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**The social construction of the quality of tea: challenges and social embeddedness for organic tea in Taiwan**

*Hung Jen TAN (China)*

The social construction of the quality of tea: challenges and social embeddedness for organic tea in Taiwan Tan, Hung-Jen, Ph.D. Associate Professor, Department of Geography, National Taiwan Normal University162, Ho-ping E. Rd. Sec. 1, Taipei 106, Taiwan brucetan@ntnu.edu.tw abstract Ping-ling township is one of the most traditional production sites of tea in Taiwan. Owing to its long history of tea plantation, Ping-ling has become a synonym to the Paochung tea, which has been famous for its flowery fragrance for decades. The Paochung tea is only made in Ping-ling area which is near Taipei Jade reservoir watershed and it has formed some particular conventions and institutions of itself in terms of the tea species, ways of growing and standards of taste and quality. Recently, as food safety and environment protection have concerned more people, some tea farmers have reorganised themselves to make organic tea. Nevertheless, the problems for these tea farmers to make organic tea include not only methods and skills in tea and tea farm management but also how to deliver and introduce new taste and standards of the quality of the Paochung tea. There has so far no room for the organic tea in local tea competition and only few retailers would give the new product a try. The study would take the viewpoints of the commodity chain theory to explore how the tea industry has been developed, how the organic tea tries to embed upon social realities in the process of recommoditization and how the new discourses of quality of tea are created and delivered in Ping-ling. In addition, the study aims to comprehend how the new products recommoditize and form alternative agro-food networks , changing the local identity in Ping-ling as a result. Hopefully, the study would make contribution to theories such as commodity chain and alternative agrofood networks by providing experiences of tea industry in Ping-ling. Keywords: Ping-ling, commodity chain, commoditization, alternative agro-food networks.



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**Effects of land consolidation on the sustainability of rural community: a comparative case study in traditional agricultural areas of China**

*Yurui LI, Zhi CAO, Yufu CHEN, Hualou LONG (China)*

Under the background of economic globalization, rapid industrialization and urbanization, the man-land relationship has changed dramatically in traditional agricultural areas (TAAs). Hundreds of millions of rural labors left home and work in cites every year. And more problems have been driven by vast and increasing out-migration of rural labors under urban-rural dual-track system, such as rural hollowing, farmland abandon, and infrastructure shortage, and those have imposed huge obstacles on improving land use efficiency and coordinating urban-rural development in China. Therefore, it's necessary to implementing land consolidation in rural China. With its wide ranges and complexity, rural land consolidation may have a far-reaching influence on the sustainability of rural community. This paper established a framework and index system for evaluating the sustainability of rural community. Then, takes three typical rural communities in TAAs as an example, this paper analyzes the impacts of three typical land consolidation (rural residential land consolidation and allocation, gully land consolidation and high quality farmland construction) on the sustainability of rural communities, using the data gotten by questionnaire survey and depth interview. At last, on considering the sustainability of rural community, suggestions for future rural consolidation in China have been put forward.



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**Ruralities and Urbanities: spaces of coexistences in small-sized university cities in diverse rural areas of Brazil**

*Wendel Henrique BAUMGARTNER (Brazil)*

Starting with the comprehension of geographical space as a constituent-form, in agreement with the Brazilian geographer Milton Santos, we can observe nowadays several possibilities to analyze the relations between rural and urban spaces inside this dialectical approach. The fast spreading urbanization in Brazil is still an incomplete process, observed in the morphological sphere of space (forms) as well in the functions and everyday life (constituent). The result of this 'unfinished' urbanization, especially in the middle and small-sized cities, it is still present traces of ruralities. Our research about the relations between ruralities and urbanities takes place in university cities located in traditional rural areas as well in the agribusiness ones. In almost ten years of research about middle and small-sized university cities, we can observe the coexistences in the conceived, perceived and lived space, taking the contributions of Henri Lefebvre, of process connecting these cities with the global urban world, but as well anchoring in the rural world. It is important to mention that we are not talking about two extreme points in the relation between urban and rural spaces, conceived as two static blocs, but thinking about the contents of these two spaces as a process in its different intensities, defined as urbanities and ruralities, coexisting in one place. In our paper, we want to explore theoretical and empirical aspects of ruralities and urbanities, bring some research results about some Brazilian small and middle-sized university cities. Other goal of our case studies is to think the Brazilian cities through the perspectives of the small and middle-sized cities not only as urban spaces but as well in the relation with the rural spaces.



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**Analysis of Stakeholders' Networks for the Agricultural Production Space in Awaji Island, Japan**

*Kunimitsu YOSHIDA (Japan)*

This study reveals interactions between agricultural production and actor's relations in Awaji Island, Japan. Farm management in farm households is examined to determine whether farm activities, such as lending equipment, supplying compost, and establishing delivery routines develop the relations among farmers or between farmers and other stakeholders, as well as identify the kind of relationships formed. Moreover, the contribution of multi-layered network formed through relations between and among such stakeholders to farm households' farm management is considered. The research method applies social network analysis. This study focuses on the extent and connection of social ties among certain nodes. Results show that in Mihara Plain, the "three crop" rotation system—a combination of paddy rice, onions, and cabbages or paddy rice, lettuce, or Chinese cabbages—has been widely promoted. The study area practiced intensive farming. The production of leafy vegetables served as an economic activity that could augment the income of farm households. Farm management as practiced by every farmer household progressed within the range of social groups such as settlements and districts, and did not become completely independent albeit done individually. Various territorial relations became a conforming frame, as seen in the sharing of equipment and supplying of compost. The network selectively formed according to the purpose. In addition to the abovementioned relations, networks based on the delivery of crops was observed. These networks extended in various ways, according to every farmer household's management policy, and had various influences on every farmer's management practices.



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**The role of social networks in adapting rural farming systems to climate variability: implications for sustainable agriculture in Pakistan**

*Muhammad ABID (Germany)*

Climate change has become one of the serious global challenges especially for developing countries that mainly consist of rural populations which solely depend on the agriculture sector for their livelihood. In order to adapt to climate change and extreme events, rural systems mainly small-scale farming systems require strategies and institutional support at the local level. This study seeks to investigate the stakeholder networks in the agricultural sector of Pakistan to assess the institutional support surrounding farmers for climate change adaptation. A household survey of 450 farmers selected through multi-stage sampling technique was conducted in three districts of Punjab province of Pakistan. Under this study, we assessed strengths and weaknesses in the social networks in three districts, Rahim Yar Khan, Toba Tek Singh, Gujrat, in order to facilitate the future implementation of adaptation strategies. Further, we also analyzed available institutional services (access to farm credit, extension services, marketing, weather forecasting services) to farmers in term of access; use, source and quality. Results indicate various missing links at a different level of institutional setup in the agriculture sector. The role of public and private sector institutions in the provision of different kind of institutional services is found very limited. The study suggested improving horizontal and vertical links among various local institutions for sustainable agriculture to ensure food security and livelihood of a rural population. For effective adaptation of local small farming systems to climate change, study also proposed an integrated social adaptive mechanism.



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**Fertility Decline and Transnational Mothering in a Rural Village of Laos**

*Futoshi NISHIMOTO (Japan)*

Evidence from rural populations suggests that fertility was brought under control due to demands for labor migration to urban centers and the contraceptive use which facilitates working away from home. The objective of this study is to assess the fertility change in the last fifty years in a paddy farming village of Laos and the effects of recent fertility decline on local social landscape. Retrospective questionnaires on birth outcomes, age at delivery, contraceptive use and migration experience were collected from 265 women including the deceased. All were born in the village or neighboring area between 1880 and 1996 and delivered of 1,007 children. Many women aged 40 or younger have experience of temporary labor migration and started using contraceptives right after the first child delivery. Total marital fertility rate (TMFR) increased from 4.6 to 6.4 between 1960s and 1970s. During the latter decade the villagers faced economic hardship due to the political regime shift. The next two decades of 1980s and 1990s find TMFR still high at 5.4 and 5.5. However TMFR sharply dropped to 2.2 in the 2000s. Age at the first delivery remained almost the same around the age of twenty throughout the five decades while birth interval lengths were deliberately extended in the last decade. Return home for delivery has become common practice for young mothers who head again for Bangkok soon after delivery leaving a child at grandmother's care. Mothering in rural Laos today cannot work without remittance from mothers working abroad.



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# C12.38 Transport and Geography

## Geographical Impacts of Transport and Regional Development 1

**Chairperson(s):** *Andrew GOETZ, Anastasia LOMAKINA*

- On the duality of transport systems – a theoretical rethinking from a transport geography perspective

  *James Jixian WANG (China)*

- The optimal topology of the transport networks of large megalopolis

  *Petr BOBRIK (Russian Federation)*

- The role of the 2010 Soccer World Cup public transport initiatives in transforming South Africa's Apartheid city structure

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- The main features of the Russian regional transport systems transformation in 1990-2014

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- The impacts of high-speed rail on Eurasia economic geography

  *Fengjun JIN (China)*

- Geographical aspects of air transport globalization

  *Vasili EVSEEV (Russian Federation)*



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  *Oriol MARQUET, Julio A. SORIA-LARA, Carme MIRALLES-GUASCH (Spain)*



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- Socio-Economic and Spatial Impacts of Transport Infrastructure in Volga Federal District
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**Russian transport issue: cities, regions and neighboring countries**

- Evaluation of the electric power network availability at the sub-regional level
  *Alexey FADDEEV (Russian Federation)*



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## On the duality of transport systems – a theoretical rethinking from a transport geography perspective

*James Jixian WANG (China)*

It has been a long-standing view that transport and travel are derived demand, for the place utility of cargo to be utilized, or activities to take place, at destinations. For this reason, the economic returns from investment in transport infrastructure are measured by the total transport or travel time savings. Any benefits realized beyond the transport systems are considered as externality or "impacts", to avoid double counting. Such a conventional view, we argue, is mobility-based, which does not properly reflect and capture the role of transport systems in altering the space of human activities, and cannot reveal adequately and properly how various stakeholders and investors see the transport systems – they see them not only as a mean to improve the mobility and connectivity for those who use the systems, but also as a way to increase the value and competitiveness of places to be connected. In other words, the power, function, and effect of transport systems in shaping the place/land value should not been regarded as externality, but a dual role of transport systems, which is of same importance as its contribution to mobility. To explain such a theoretical construct of transport duality, a new conceptual model is established as an attempt to illustrate two processes which act as the shadow or dual to each other: a process of mobility gain, and a process of accessibility gain. An extensive literature review and a plenty of cases are used to support this model and illustrate how it works.



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**Transport investment and smart growth planning: Travel behavior and land use impacts of rail transit and transit-oriented development in Denver, Colorado, USA**

*Andrew GOETZ (United States of America)*

As large cities seek to expand their transit systems to accommodate increasing travel demand, provide alternatives to growing road traffic congestion, and improve accessibility, more research attention has been focused on the travel behavior and land use effects of transit systems, most notably in the form of increased transit, bicycling, and walking related to transit-oriented development (TOD). Many cities in the USA are starting or expanding rail transit systems with objectives that include increased transit ridership and more focused land use development near transit stations and along transit corridors. Denver, Colorado is one of the cities that is aggressively expanding its rail transit system and encouraging higher-density, mixed-use development in the station areas. Evidence from 1997-2013 indicates that the scope of transit-oriented development in Denver is considerable, resulting in 27,172 housing units, 6,788 hotel rooms, 6.8 m sq ft of office space, 5.5m sq ft of retail space, and 7.1 m sq ft of medical space in urban centers within one-half mile of existing or planned transit stations. From 2005-2010, 21% of the region's housing growth occurred in 103 urban centers (accounting for only 1% of the total land area of the region) and from 2005-2013, 55% of new employment in the region was located in these urban centers. The investments in rail transit and transit-oriented development are having impacts on travel behavior, especially in the downtown area where nearly half of commuters use transit, 35% drive alone, 7.3% bicycle, and 4.5% walk.



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## The optimal topology of the transport networks of large megalopolis

*Petr BOBRIK (Russian Federation)*

The formalized problem of an optimal disposition of basic highways in the homogeneous territory is considered mathematically. On the one hand costs of maintenance and operation of highways which are proportional to their length are considered. And on another, the economy on transition time across the territory in comparison with a case without highways. As shown, the optimal solution can be understood through regular transportation networks, focusing on the simplest types of them like quadratic and triangular networks. We found the analytical formulas to evaluate the economic efficiency and optimal parameters of the elementary topologies of transport networks. It is offered to use the found solutions at long-term planning of the main transport skeleton of large megalopolises.



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# The role of the 2010 Soccer World Cup public transport initiatives in transforming South Africa's Apartheid city structure

*Schalk van HEERDEN (South Africa)*

South African cities, as other cities in developing countries, are characterised by urban sprawl. Public transport challenges arise as a result of sprawling cities and render cities largely inaccessible. South African urban development was guided by Apartheid spatial planning policies that displaced socio-economically vulnerable groups to the urban periphery. South African urban development policies since 1994 were grounded in the densification and integration of cities in an attempt to address Apartheid spatial planning. Public transport was set to play a pivotal role as a policy mechanism in integrating the urban periphery into South African cities. The 2010 Soccer World Cup (SWC) presented an opportunity to the South African public transport sector to initiate new public transport projects and upgrade existing public transport systems. Public transport policies formulated in preparation for the 2010 SWC emphasised that 2010 SWC public transport initiatives should address spatial imbalances of Apartheid spatial planning. This research provides an overview of 2010 SWC public transport initiatives that were undertaken in four SWC host cities. The four SWC host cities are: Johannesburg, Cape Town, Tshwane and Durban. Based on interviews with public transport policy makers and commuter usage data, the research details what each host city's public transport plans were, what initiatives were completed by 2010, and how these public transport initiatives have been utilised after the 2010 SWC. The research concludes with a discussion of how the 2010 SWC public transport initiatives have transformed the host cities' Apartheid spatial structure.



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## China's Geopolitics of Transport to Access Central Asia

*Nidhi DABAS (India)*

The transport links are geopolitically important, as they effect the strategies of a particular state towards a region. The important transport routes in the past have been a major reason for the development of particular regions, the old Silk Route is one example. The world has now become more interconnected. The geography of a region has played an important role in the relation between one nations to another through transport links. The limitations created by the natural terrain or geography has been overcome by the new technological development in the transport sector. In today's world politics, the access to some of the strategically important places could be useful for a particular nation. The access to these strategically beneficial places have always been on the foreign agenda of different nations. The making of transportation links is one of the ways through which the access to these places is being done. China is one such country which is using this method to have access to the places like Central Asia, South Asia and South East Asia, from where it can have important resource and economic access. The aim of the paper is to show how transport of an area becomes a geopolitically important entity and how geography plays an important role in determining the patterns of these transport links. The recent advances of China in the transport sector through investment in Central Asian territories is a useful case study to show the 'politics of routes' by China in the region.



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## RAILWAY TRANSPORTATION AND TERRITORIAL DEVELOPMENT. Connecting the Atlantic to the South American Pacific

*Milagros HINOJOSA, Roberto CHIARELLA (Peru)*

In the context of globalized production and global markets, some issues become more important, especially those related to transportation costs; delivery opportunity; quality of service; transportation volume; access to infrastructure, markets and supplies - among others - in its relationship to territorial sustainable development process. This article examines the potential territorial impacts of the transcontinental railroad that aims to connect the Atlantic to the Pacific coast of South America (FETAB). This train means a challenge as it must pass through the vast Amazon region (with high biodiversity and fragile ecosystems) and the Andes Mountains. This mega transport project – which implicates an approximate investment amount of US $ 20.000 million - involves the participation of three main actors: Peru, Brazil and China. Our study object is transport treated as a phenomenon and / or process in space, considered in its close relationship with the social, economic and environmental conditions of the territory. We focus the meaning and influence of the envisaged network and the flows of merchandise on the territorial development, privileging the study of the Peruvian part of the network. We believe that the project will be characterized by inducing alterations in the accessibility of certain areas, which, in turn, will influence the sustainable development of the territory – including massive employment generation. Finally, it should be added that the drive markets of this train project are Brazil, China and the APEC (Asia Pacific Economic Council).

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**The structural effects of freight forwarders' activity on territories: the case of the port Le Havre and the port of Antwerp**

*Marina ZAKHAROVA (France)*

Freight forwarders, known as the "transport architects" (FIATA) of global supply chains are involved in the trade between territories and their populations. However, they remain invisible in the transport chain: often the final consumer is not even aware of their contribution to the "right product in the right place and time". These are the players who provide the link between the demand and the supply of transport, when it is not directly handled by manufacturing companies, and their organizational strategies are accompanied by spatial strategies that are the rare subjects of scientific papers" (Brocard and al. 2009) . The first aim of this paper is to define and to rethink the profession of the freight forwarder by examining this profession in France; moreover the analysis of their locational strategies along the Seine Corridor will be provided. The second aim is to reveal the crucial question: do the freight forwarders generate their "structural effect" on territories? In particular, we will pay attention to the territory of the Seine Corridor, especially to the port of Le Havre; and to the port of Antwerp. French freight forwarders transit 40% of goods through the port of Antwerp and other North-West European ports (Merk, and al., 2011) . Since they feed ports other than the national ports with national goods, freight forwarders may hold the key to our understanding of the following issues: are the freight forwarders the real decision-makers in transport chains or does that power belongs to the shippers; and what reasons, influencing the choice of transport routes, can be identified?
Keywords: Freight forwarders, Global supply chains, spatial strategies, structural effect, Seine Corridor



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**The impacts of high-speed rail on Eurasia economic geography**

*Fengjun JIN (China)*

Since the first high-speed rail (HSR) line was opened in 1964, East Asia and Europe have become the regions with the first and second largest HSR network in the world. The integrated HSR network has formed in Europe, while the HSR network in East Asia are separated in Chinese mainland, Taiwan China, South Korean, and Japan. To promote the development of Eurasia economic integration, some governments and scholars have proposed to build high-speed transport corridors connecting the core cities in both Europe and Asia, such as, Beijing-London HSR line, Beijing-Moscow HSR line etc. The forming integrated HSR network in East Asia and Europe has much larger influence on spatial-economic system. In this paper, we firstly tried to explore the time-space effects caused by HSR network and the service market of the integrated HSR network in East Asia, which is connected with each other by short-distance multinational HSR lines. Secondly, this paper will explore the influence of integrated HSR network in Eurasia on transit choice, regional development and cooperation, considering the competition and cooperation mechanism with the other transport modes and the accessibility improvement caused by potential HSR lines. Finally, this paper will summarize the relationship and cooperation mechanism of the main countries in Eurasia after the integrated HSR forms.



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## Geographical aspects of air transport globalization

*Vasili EVSEEV (Russian Federation)*

Air transport industry gradually transforms from industrial business-model "national flag carriers" to global industry model. The rate of such transformation seriously depends on national traffic regulation rules. The influence of this factor is revealed in wave transformation of the industry business model. This process started in 1978, after liberalization of the US market. During the first wave, the US market evolved to the modern configuration. Next wave started in the early 90s and resulted in modern European aviation configuration. Now the same processes are close to completion in two regions. The first one combines the Middle East and South Asia countries. The second - is the Asia-Pacific region. South America belongs to the earlier stage of such evolution. This process is likely to be completed in Africa. It will be in the fourth wave. In the nearest future, the global industry will have the configuration of regional systems assembly. Nowadays one can see several types of regional systems interaction. The interaction varies from severe competition, like in the case of European & the Middle East systems, to deep strategic partnerships. This way is typical for European & North American systems interaction. The way how assembly systems will transform into a joint configuration is a very complicated problem. In spite of the Open sky trend, this process can take several decades. Regional configuration depends on combination of factors. Geographical element of future global system will be inactive. It may be transformed only occasionally after general economic and social changes or due to activities of local governments.



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**Nodal and service functions of High Speed Rail stations in small and medium-sized cities in Spain**

*Eduardo OLAZABAL, Carmen BELLET (Spain)*

The Spanish High Speed Rail (HSR) has opted to build a network with many intermediate stops, instead of direct inter-metropolitan connections. In this scenario, most of the HSR stations are placed in small and medium-sized cities or in less densely populated territories. This paper will analyze the nodal and service functions of these stations through a series of comparable indicators, previously applied in similar studies in France and The Netherlands. The results show the characteristics of each rail transport node in terms of traffic, services offer, simple accessibility and nodal functions. This study provides insights into the role that each station plays as a transport node in small and medium-sized cities served by HSR. Due to the future arrival of more HSR stations to small and medium-sizes cities, it is necessary to reconsider their role as transport nodes, as well as the challenges and opportunities that this new situation poses and opens up.



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**Dynamics around peripheral High-Speed rail stations: the Spanish case**

*Carmen BELLET, Carmen VAZQUEZ (Spain)*

As many academic literature has already pointed out the main vocation of HSR is to unite the cores of the largest metropolitan poles. But. HSR lines have, however, also incorporated intermediate stops along the way in response to local pressure and in order to capture other markets. Many of these intermediate stops are peripherally located in small and medium-sized cities or are in less densely populated territories with few (or less evident) urban polarities. In such cases, the economic logic of transport efficiency generally takes pride of place over the other needs of the existing territorial structure. The main challenge facing a peripheral HSR stations is how to integrate it into the territorial structure and improve accessibility in order to take the fullest advantage of the new transport mode. When these stations are located on the urban periphery, this usually offers the opportunity to develop large swathes of land around them. Local strategies often aim to develop new economic areas around such new stations. This paper analyses the urban plans and strategies that have been undertaken around peripherally located HSR stations in Spain. But HSR Spain's peripheral stations cannot be analysed as a single typology because they respond to different logics. The territorial context and station-node position on the line are very important for understanding the role and function that each station performs and the main strategies that local stakeholders have planned and carried out. Taking this into account, we could classify Spain's the eight existing peripheral railway stations as one of fourth different types.



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**Change of accessibility by LTR and its prospective contribution to greenhouse gas emissions in Singapore**

*Koichi TANAKA (Japan)*

Heavy traffic jams have been a serious urban transportation problem in Singapore, which is a small Southeast Asian city-state with a high population density. Various urban transport schemes, such as the Electric Road Pricing (ERP), have been introduced to improve this situation. Further, the MRT and LRT networks have been gradually expanded since the beginning of operations in 1987. The MRT network has a route length of approximately 180km and facilitates the modal shift from private cars to public transport. The LRT is important as a feeder to the MRT network. By 2030, the route length of these networks is planned to be expanded to 360 km. The Singaporean Land Transport Authority's goals are that 80% of households should be not more than a 10 min walk from a station. The purpose of this study is to measure how MRT and LRT residential accessibility changed and is expected to change in Singapore from 1989 to 2030. Further, the residents' modal shift from private cars to the MRT and LRT is investigated to clarify an efficient method for mitigating greenhouse gas emissions. There are three reasons for selecting Singapore as the study area: high population density, high private car ownership, and the multiracial nature of the city state. The environmental efficiency of the MRT and LRT has not yet been clarified in such a large city in Southeast Asia from a transport geography aspect. In particular, this study focuses on how the modal shift from private cars to public transport in such a densely populated and deeply motorized society contributes to a decrease in greenhouse gas emissions. Moreover, accessibility differences between the ethnic groups in Singapore are examined.



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**Understanding the relationship between accessibility and economic growth: A case study from China (1990-2010)**

*Jiaoe WANG, Jingjuan JIAO (China)*

China's economy and transport infrastructure have both experienced rapid development following the country's program of economic reform and opening up in 1978, especially after 1990. Today, China is the world's second largest economic entity in terms of GDP and has the largest highspeed rail network and the second largest expressway network. This paper explores the relationship between accessibility and economic growth in China from 1990 to 2010.In the study, data from 333 prefecture-level cities and 4 municipalities were examined and a bivariate analysis framework of economic growth and accessibility, economic growth rate, and accessibility increase rate was applied to examine the relationship from cross-sectional regional and time series perspectives. In the results of this analysis, first, accessibility and economic growth showed a significant positive relationship from both the cross-sectional and panel data, while accessibility increase rate and economic growth rate indicated no significant relationship from the cross-sectional data and a poor significant relationship from the panel data. Second, the distributions of local advantage, in terms of economic growth and accessibility and accessibility increase rate and economic growth rate, were uneven. Cities with a lower local advantage with respect to economic growth and accessibility were mainly located in China's eastern coastal region or the provincial capitals, while those with a lower local advantage in terms of accessibility increase rate and economic growth rate were located in the western region. Third, as economic growth and the transport networks evolved, the distribution of local advantage showed little change in terms of economic growth and accessibility, but a larger change concerning accessibility increase rate and economic growth rate, largely influenced by the distribution of expressways and high-speed rail networks.



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**Exploring the varying impact of mega transport infrastructure on the evolution of urban space structure: A case of Shenzhen, China**

*Yonghai SUN, Zuopeng XIAO (China)*

Transportation and mobility system is considered as the most important element in urban development through the linkage and accessibility it provides to inter-and intra city socioeconomic activities. Regardless of the developing or developed countries, a large number of scholarly researches have revealed the interactive relationship between transport infrastructure (including, facilities and road network) and urban growth. However, less is conducted to explore the effects of different transportation infrastructure type on urban growth and changes, especially for those new-emerging cities. Taking Shenzhen for case study, it is a new-established city rising after 1978 adjacent to Hong Kong. After 30-years rapid development, it have become one of first–tier cities with population over 15 million, economic scale top 4 in mainland China and container volume top 3 in the world. This paper attempts to examine the varying impact of mega transport infrastructure projects in organizing urban spatial structure. Under the triad framework of economy, transport and urban development, the course of transport infrastructure development in Shenzhen is traced and divided into four stages. Thereafter, the success and failure of railway, seaport, road express and airport projects in boosting urban development and shaping city layout are compared and evaluated with typical transport-related cases. We argue that seaports play more important role in creating sub-centers than airport for the industrializing Shenzhen; railways is not so significant as road in forming urbanized corridors due to export-oriented economic development model. Transport infrastructure cannot exert expected outcomes in urban growth if projects can't accommodate the specific economic and policy context. The inequity and unbalance of urban development in Shenzhen is also closely associated with specific transport infrastructure provision and organization differing in different sub-city districts. This study can provide empirical experiences and policy implications for other rapidly growing cities to organize comprehensive transport system and further to balance urban spatial structure.



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**The governance of transport infrastructures in Spain: tensions from the state to the regional level**

*Mateo Varela CORNADO, Rubén LOIS, Miguel PAZOS (Spain)*

In Spain, land planning policies are competence of the autonomous regions, as established in the 1978 Constitution. With regard to transport infrastructures, the central government has the control of the most important ones (the so called "General Interest of the State" roads, highways, railways, airports and ports). Only the regional and secondary ones are ruled by the autonomous regions. In this context, since the beggining of the democracy, central government took advantage of transport policies to influence in the land planning at state level. Given the important role of transport infrastructures in the territorial dimension of economy and social and cultural factors, there is a lack of effective decentralization in the country, which has important implications with regard to political tensions between center and peripheries. In the last decades, different transport sectoral plans (Director Plan of Infrastructures, PDI; Strategic Plan of Transport Infrastructures, PEIT; Housing and Transport Infrastructures Plan, PITVI) have reinforced the importance of Madrid and the Mediterranean Corridor. Spain has now the second largest high-speed rail network in the World, and this was a mainly a political project trying to reinforce Madrid´s role as the capital of the State and basic node of the transport network. The aim of this presentation is to explain this process from the governance of infrastructures point of view, analyzing the main actors and agents, and the tensions between the different territorial levels.



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**Small regional air transport 2.0 - a way to enhance regional accessibility in Europe?**

*Sven MAERTENS (Germany)*

Under pressure from low cost carriers and hub&spoke networks, most independent regional airlines that used to directly connect regions in Europe have ceased operations. Hence, many thin routes that used to be served at relatively high frequencies by small regional aircraft have disappeared, and many (remote) regions have lost air transport connectivity. Low cost carriers hardly make a good substitute for business travellers as frequencies tend to be low. A successful re-vitalization of small regional air services could therefore yield in better regional connectivity and help improving the utilization and financials of hundreds of smaller airports and airfields. In our paper, we discuss the viability of, and requirements for new and innovative regional air transport concepts. We employ air transport cost and demand data and information gained in stakeholder interviews to assess three main issues: • Current and future small aircraft technologies and resulting unit cost impacts; • Measures for the reduction of operational costs at carrier, ATM and airport level, which might help reducing small air transport operating cost; • Assessment of potential supply patterns and demand levels, as well as resulting social-economic impacts, such as on connectivity and airport financials.



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**Road Traffic Accident Patterns in Vhembe district, Limpopo. South Africa; Action Decade for Road Safety Begins**

*Nthaduleni NETHENGWE, Olujimi OSIDELE, Farai DODONFEMA (South Africa)*

Road transport safety is challenging globally, most especially in developing countries where it affects both road users and governments of individual countries. The aim of road traffic safety is to ensure reduction or total eradication of road fatalities and other injuries that are related to road accidents resulting from public road usage. In South Africa, one of the major problems faced by the Department of Roads and Transport is the issue of road traffic accidents. The annual road traffic accidents have increased to over 500,000 and 28,000 or more are fatal which led to serious injuries between 2004 and 2010 as reported by the Department. The study analysed the patterns and trends of road traffic injuries and fatalities in Vhembe District Municipality from 2011 to 2014 also map road accident hotspots using linear analyst. The research further established the possibility of any correlation between accidents spots and road design geometry. Factors that are responsible for road traffic accidents leading to fatalities, injuries, death and loss of property were also examined. Finally, the study evaluated any significant reduction in the road accident occurrence rate within the last four years in Vhembe District since the commencement of World Health Organisation; Decade of Action for Road Safety 2011-2020. The study provided recommendations that will be geared towards contributing to road transport safety policy which can be integrated into the national enforced policies of the Department of Roads and Transport.



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**The 3Ss of car use. Understanding the influence of socioeconomic and lifestyle attributes on modal choice and car use in the Barcelona Metropolitan Region**

*Oriol MARQUET, Julio A. SORIA-LARA, Carme MIRALLES-GUASCH (Spain)*

Over the last decades much empirical evidence has proved on the importance of the built environment issues at determining modal choice and travel behavior. The seminal work of Cervero and Kockelman (1997) found that Density, Diversity and Design were crucial dimensions affecting people's choices on driving, riding and walking during a trip. On a latter work, Ewing and Cervero (2010) also acknowledged the role of socioeconomic settings at determining an important share of mobile behavior. In addition, other scholars have also noted the relevance of some social behavior factors at explaining not only modal choice, but also trip frequencies and distances (Scheiner, 2010). Despite the mentioned findings, a limited attention has been traditionally paid to know the relevance of both socioeconomic and lifestyle issues on modal choice and travel behavior. This could be due to a lack of manageable data among others. The paper sets out to quantify the main factors inducing car use to reach a suburban college campus in the metropolitan area of Barcelona, Spain, including not only built environment variables, but also socioeconomic and lifestyle indicators. By using a Chi- squared Automatic Interaction Detection (CHAID) method, together with non-parametric tests (Mann-Whitney U), we are able to analyze the importance of the 3S's –Spatial location, Socioeconomic issues, Social behavior- at determining modal choice and actual distance traveled by car. The use of decision trees allows us to go further from regression analysis and to look at the specific hierarchy between factors, adding important nuances that are commonly overlooked in traditional analysis in the field. Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, Design and Diversity. Transportation Research Part D: Transport and Environment, 2(3), 199–219. doi:10.1016/S1361-9209(97)00009-6 Ewing, R., & Cervero, R. (2010). Travel and the built environment. Journal of American Planning Association, 76(3), 265–294. Scheiner, J. (2010). Social inequalities in travel behaviour: trip distances in the context of residential self-selection and lifestyles. Journal of Transport Geography, 18(6), 679–690. doi:10.1016/j.jtrangeo.2009.09.002



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**Interregional mobility in Russia as a buster of economic growth**

*Pavel CHISTYAKOV (Russian Federation)*

The 3-years long field research of passangers' flows between Russian regions conducted by Infrastructure Economics Centre revealed tha the mobility in Russia is much higher than it is shown in statistics. The speed of interregional trips has significant effect on productivity, income and property prices. My presentation will show the intencity of interregional flows of passangers and the influence of this flows on economic growth.



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**The subway role in development of the capital agglomeration of the Republic of Korea**

*Pavel EM (Russian Federation)*

The first train of Seoul subway was launched in 1974. There are 429 stations today. The subway has passed network's morphological evolution from 1990 to 2014: the number of cycles increased 4 times from 13 to 52. Hence, the number of transfer stations that significantly improved the accessibility of the system and expanded the boundaries of the agglomeration, has increased. The development of the subway was the reason of decongesting a deconcentration the Capital (from 10.23 to 9.79 mln) and increasing the population of Province surrounding the capital from 7.65 in 2000 to 12.22 mln in 2011. Availability of high-speed transport in combination with cheaper real estate prices and better environmental conditions increased the attractiveness of Gyeonggi Province because its inhabitants have almost all the privileges of the capital life. An attempt was made to compare the quality of life in elements of the capital agglomeration of the Republic of Korea with and without subway stations. Generally, the quality of life in elements with metro stations is higher than in elements without them. The empirical analysis revealed a high correlation between the population density and the degree of uniformity, studied by the index of fractal dimension. It was found that the degree of uniformity is higher in areas of new buildings, rather than the traditional one.



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**The impacts of "politics of scale" in planning intercity railway system in China's Pearl River Delta**

*Jiang XU, James Jixian WANG (China)*

Over the past three decades, we have seen a flourishing of scholarship to interrogate the spatiality of China's cities and regions. Two groups of scholars have offered different interpretations. One group accentuates the eroding power of the central state and the rise of cities and regions as new scales of capital accumulation, state regulation, and political compromise. The other group highlights economic decentralization and market reform as manipulated policy tools, giving rise to expanding state power and hierarchical control. This paper uses the Pearl River Delta Intercity Railway (ICR) System as a case study to challenge these one-sided and unidirectional views. It argues that a perspective of "politics of scale" should be employed to avoid over-extending theories of either decentralization or deep-rooted hierarchical control to be a full-blown explanation of China's urban and regional transformation. Impacts of "politics of scale" over the users of ICR system will be explored using a recent large-scale questionnaire survey on Guangzhou-Zhuhai ICR.



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**Road Transport and Agricultural Development, wudil Nigeria**

*Abdulkadir Muhammad DAMBAZAU (Nigeria)*

Transport Factors influencing Agricultural Development In Wudil Local Government Area, Kano State M. A Nababa maryamadonababa@gmail.com & A. M Dambazau abalhafsah@yahoo.com Department of Geography, Faculty of Earth and Environmental Sciences Kano University of Science and Technology, Wudil _____ Abstract The research was carried out to identify transport related factors influencing agricultural development in rural areas of Wudil Local Government Area of Kano State. Data from two hundred respondents were collected from five study villages namely Darki, Indabo, Danfadal, Makera and Turari selected based on their access characteristics of poor, moderate and good. A structured interview schedule was used to collect data from the respondents selected using a simple random sampling technique. Thirteen variables were included in the model and assumed to influence farm output. A step wise multiple regression analysis was used in order to identify the major transport factors which influence farm yield. Analysis of the data shows that transport cost to and from market and educational attainment explained 51% of the variation of the dependent variable with a coefficient value of 5.261 and 4.799 respectively. The regression equation obtained is Y= 130831.676+5.261TCTAFM+4.799EDLS. The study recommends among others the need to improve the existing condition of rural roads and assist rural people with loans to acquire an Intermediate Means of Transport. _____ __ Key words: Rural Roads, Transport, Intermediate Means of Transport, Agricultural, Development Sub theme:Transportation Transport Factors influencing Agricultural Development In Wudil Local Government Area, Kano State M. A Nababa maryamadonababa@gmail.com & A. M Dambazau abalhafsah@yahoo.com Department of Geography, Faculty of Earth and Environmental Sciences Kano University of Science and Technology, Wudil _____



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## Detecting Arctic Ice Roads and Related Industrial Activities with Remotely-Sensed Night-Light Imagery

*Mia BENNETT (United States of America)*

Ice roads are often the only cost-effective means of transporting goods and supplies to communities and natural resource extraction sites in remote parts of the Arctic. Yet there is no pan-Arctic ice road map. Remotely sensed images from the 750m Suomi NPP Day/Night Band (DNB) of the Visible Infrared Imaging Radiometer Suite, which can detect individual icebreakers and even trucks, may, however, allow the construction of such a map. With focus given to the world's longest heavy-haul ice road, Canada's Tibbitt to Contwoyto Winter Road (TCWR), I compare a time series of Suomi NPP images from winter 2013 and 2014 with Landsat 8 imagery and existing maps. I demonstrate that the TCWR's path can be discerned by using a top-hat filter on a stacked series of Suomi NPP imagery. Furthermore, key points of infrastructure along the way, like rest stops, can be detected. This bodes well for future applications of DNB imagery to map ice roads in places like the Russian Federation, for which there is a dearth of publicly available maps. Knowing the location of ice roads is important for two reasons. First, these data can signal sites of natural resource extraction in places for which information is not widely disseminated. Second, new geospatial datasets for ice roads can be combined with models assessing impacts of climate change on circumpolar land accessibility. As warming temperatures threaten shorter ice road seasons, communities and mines alike need to prepare for changes to their transportation infrastructure, built out of the landscape itself.



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**Transport-geographic position of Russia and Canada: influence of northerness and continentality**

*Anastasia LOMAKINA, Leonid BEZRUKOV (Russian Federation)*

Russia and Canada share much in common in terms of geographical location. The situation in high latitudes and interocean position are the more important traits that influence transport-geographical and transport-economic location of both countries. However, a quick look at the map do not always allow to identify the real sources of transport-economic properties of the territories. In our study we propose a method, which yields to estimate continental location in transport-geographic terms. In the research the estimation of transport-geographical location of Russian and Canadian territories, population and mining industries is considered. Their comparison confirm the constant influence of the northness as well as the level of transport infrastructure of the territories. In both countries continental and ultracontinental zones are leading in share of territories, also in producing and exportation of the large-tonnage raw materials – oil, coal, ironstone. As for population, it concentrates predominantly in maritime zone in Canada on the contrary of continental zone in Russia. Canada and Russia have common and specific traits of their transport-economic and transport-geographic continentality as well as their approaches to compensating its negative influence and overcoming transport-economic challenges.



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**The impacts of high-speed rail on Eurasia economic geography**

*Fengjun JIN, Jingjuan JIAO (China (Beijing))*

Since the first high-speed rail (HSR) line was opened in 1964, East Asia and Europe have become the regions with the first and second largest HSR network in the world. The integrated HSR network has formed in Europe, while the HSR network in East Asia are separated in Chinese mainland, Taiwan China, South Korean, and Japan. To promote the development of Eurasia economic integration, some governments and scholars have proposed to build high-speed transport corridors connecting the core cities in both Europe and Asia, such as, Beijing-London HSR line, Beijing-Moscow HSR line etc. The forming integrated HSR network in East Asia and Europe has much larger influence on spatial-economic system. In this paper, we firstly tried to explore the time-space effects caused by HSR network and the service market of the integrated HSR network in East Asia, which is connected with each other by short-distance multinational HSR lines. Secondly, this paper will explore the influence of integrated HSR network in Eurasia on transit choice, regional development and cooperation, considering the competition and cooperation mechanism with the other transport modes and the accessibility improvement caused by potential HSR lines. Finally, this paper will summarize the relationship and cooperation mechanism of the main countries in Eurasia after the integrated HSR forms.



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## The Resolution Of The Transport-Communication Problem As The Key Development Factor For Siberia

*Leonid BEZRUKOV (Russian Federation)*

In Russian society and abroad, it is widely believed that development of Siberia is unprofit-able. Such views are usually substantiated by the influence of unfavorable geographical conditions, such as the natural-climatic and transport-communication factors. With reference to the effects of the severe natural-climatic conditions, it is worthy of note that the south of Siberia is well suited to a normal human life, while a dramatic rise in the cost of production and livelihood is observed in the Near North and, especially, in the Far North. The influ-ence of a severe climate on economic effectivenessa is currently mediated through the use of special adaptive methods of organizing the economic activities. The effect of the transport-communication factor implies a large remoteness of Siberia from sea routes and major world markets, which is responsible for a high level of transportation costs. The essence of the problem is that the effectiveness of transportation by land transport facilities is excelled many times by the effectiveness of sea transportation. Furthermore, Siberia has within its boundaries huge territories difficult of access, with no year-round transport routes available. The transport-communication factor continues to be a drastic deterrent to a full-fledged de-velopment of Siberia; however, its negative influence can be attenuated thanks to the ongoing pack-age of special-purpose strategic measures. Thus, the construction of the planned railroads and motor roads will result in a dramatic reduction in transportation costs in almost a hundred areas of Siberia. The creation of the Transsib-based transcontinental high speed corridor will make Siberia "come much closer" economically to the leading centers of the country and the world.



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**The issue of natural gas transportation in Russia: developing the gas pipeline network to integrate Russian Eastern Regions or to connect with Asian Neighboring Countries?**

*Sophie HOU (France)*

The transport networks on the Russian territory show a marked contrast between the Western regions and the Eastern regions of Russia. In the field of energy transportation, the contrast is obvious: there is no integration of the energy transport systems at the scale of the Russian Federation. While natural gas is an important resource for the country, the existing system of transport does not cover the whole Russian territory Eastern regions of Russia are not linked with the gas transport and distribution network. Economic as well as strategic issues are at stake. First, Eastern gas fields are not exploited yet, whereas a production basis is necessary to develop the gas pipeline network. Secondly, for this network to be profitable, a certain density of potential consumers is needed, while Siberia and the Russian Far East are sparsely populated regions. As a consequence, the development of gas transport network on the Eastern Russian regions depends not on the domestic market, but on the markets of Asian neighboring countries. This presentation aims at highlighting the multiple issues at stake in the field of natural gas transport. How does the arbitration between the economic, politic, social and strategic issues reflect on the projects of developing the gas transport network and its configuration?



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**Socio-Economic and Spatial Impacts of Transport Infrastructure in Volga Federal District**

*Elena KONCHEVA (Russian Federation)*

The emergence of "new economic geography" has brought about new explanations for the uneven distribution of economic activity across regions. The increasing attention is being paid to the so-called "second nature geography", characterizing the location of economic agents relative to one another instead of "first-nature geography", describing the distribution of resources. This means that transport accessibility of the region in relation to other regions weighted by their importance is referred as one of the most crucial factors for regional development. Thus transport accessibility is the main "product" of transport infrastructure. By improving accessibility transport infrastructure encourages the development of urban agglomerations. The empirical research of transport accessibility impact on the socio-economic and spatial development of municipalities in Volga Federal District has shown strong interdependence between municipalities transport accessibility and the main socio-economic indicators. There is also a strong interdependence between the transport accessibility and the population growth rates and migration rates across the municipalities. Volga Federal District is home to the 6 of the 20 largest urban agglomerations in Russia. The region is relatively homogeneous in terms of "first-nature geography" which helps to assess the role of transport accessibility more precisely.



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**Integrating active transportation into transportation systems: Urban cycling in Moscow Russia**

*Asya BIDORDINOVA, Paul HESS (Canada)*

Active transportation (AT) modes such as walking and cycling are increasingly being integrated into urban transportation systems around the world. Urban cycling in particular is being pursued in many high-income countries as a way to improve mobility and health, and to help meet economic, and environmental goals. By examining the case of Moscow, this paper examines whether urban cycling can support these goals in post-Soviet countries also. Most large cities in Russia and other post-Soviet countries share a legacy of planning that supports some aspects of AT, including high quality pedestrian infrastructure, developed transit systems, and generous, connected park systems. Cycling infrastructure and planning is rudimentary or lacking however. Moscow is an exception. The City of Moscow is developing cycling policy and implementing new infrastructure such as bike lanes and parking. Additionally, there are new privately funded public bike sharing systems, and the public and cycling groups have new opportunities to participate cycle planning. Given that cycling was not traditionally considered a mode of transportation, Moscow is now learning and emulating cycle planning and infrastructure strategies from other countries. This paper evaluates how these borrowed policies and strategies are being implemented in Moscow. It will analyze the type of transfer from other countries - borrowing, emulating, copying, etc. - and whether the policy transfer was successful. It further speculates whether policies and strategies developed in Moscow can be disseminated to similar contexts and whether they are applicable to other large, post-Soviet cities.



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**Evaluation of the electric power network availability at the sub-regional level**

*Alexey FADDEEV (Russian Federation)*

An objective to find out areas that need an improvement of the electric power infrastructure is very important in modern Russia, because excess investment programs of natural monopolies must be reduced according to recent governmental instructions. Some technical indicators are usually used to determine priority projects that have to be funded first of all. However, geographical, interdisciplinary criteria can also be used. The aim of the research is to use geography-based methods to evaluate the availability of the electric power network at the sub-regional level. Nizhniy Novgorod region of Russia was used as a base of the survey because of its relatively high network complexity. Some basic clustering techniques had been used to divide the regional power network by several clusters, which were taken as objects of the following research. Three criteria were chosen to estimate the development level of these clusters: security of supply, capacity reserve margin and topological complexity, estimated according to some geographical methods. On the basis of these criteria, areas the severe a lack of the network infrastructure were found. Finally, projects that had been proposed in the regional power infrastructure development plan, were examined by the necessity that had been estimated in the preceding part of the research.



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**The main features of the Russian regional transport systems transformation in 1990-2014**

*Petr KRYLOV (Russian Federation)*

During large transformation of economy of Russia from 1990 to 2014 There were essential changes in Russian regional transport systems. - Increasing of the contrasts between economically safe and unsuccessful regions. Growth of transport streams isn't a major factor of development of transport infrastructure in regions of Russia. The internal and external transport relations are weakened in the majority of regions. Thus internal communications weakened owing to degradation of rural areas, reduction of the area of economically developed territory. Weakening of external relations can be explained with growth of transport tariffs, and also by establishment of the new directions freight and passenger traffics. - Border and cross-border transport communications at the level of certain regions are increasing, especially with China. - Strengthening of an agglomerative factor round the largest cities as an objective tendency of development of Russia. Growth of the development of suburban territories of the cities led to allocation of the Russian agglomerations in a new form of the regional transport systems which aren't caused by administrative borders. - Gradual increase of a role of the motor transport at decrease in a role railway and aircraft transport. Rational radius of transportations by motor transport of freights was beyond the far average region of the European Russia (because of poor control in railway branch). The aircraft transport in intra regional transportations remained almost only in the poor developed regions of Siberia and the Far East. - Strengthening of pair communications as a result of the increasing concentration of economic activity in the large and largest cities. Double centric transport systems communicate the high-speed regular connection.



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# C12.39 Urban Commission: Urban Challenges in a Complex World

## Historical Cities: activities and management through a comparative perspective East/West-North/South 1

**Chairperson(s):** *Rubén LOIS GONZÁLEZ, Yamilé GUILARTE*

- Cultural Hinderance To Urban Renewal In The Traditional Walled City Of Kano, Nigeria
  *Ibrahim DANKANI (Nigeria)*
- The historic city of Toledo (Spain), World Heritage and tourist attraction: realities, problems and tourist planning and management
  *Luis Alfonso ESCUDERO GOMEZ (Spain)*
- Contribution of Western Travelers to Makkah "Mecca" Maps
  *Ramze ELZAHRANY, Meraj MIRZA (Saudi Arabia)*
- GIS-technologies to investigate and manage cultural landscape
  *Valentina TOPORINA (Russian Federation)*
- Heritage production: constructing urban future on/around the memories of the past
  *Yu-Chieh HSIEH, Kuang-Ting HUANG (Taiwan (China))*

## Historical Cities: activities and management through a comparative perspective East/West-North/South 2

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- Cultural landscapes: approaches to assess and provide stability
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- Cultural attractions in the historical cities of Havana and Santiago de Compostela: tradition and modernity
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- Mont-Saint-Michel and its Bay: Natural Heritage in the Service of Cultural Heritage
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**Complex Urban Systems 1**

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# CULTURAL HINDERANCE TO URBAN RENEWAL IN THE TRADITIONAL WALLED CITY OF KANO, NIGERIA

Ibrahim DANKANI (Nigeria)

This paper examines the challenges culture and cultural practices pose to urban renewal in Kano walled city.. The ancient city of Kano is presently an area posing a serious threat to urban development because the area still retained the morphology of the pre-colonial setting, where buildings are built close to one another and structures are usually separated by narrow winding paths capable of accommodating only pedestrian, donkeys and horses. This area is often the most deteriorating part of the city hence, the need for renewal. All efforts of present and past governments did not see the light of the day due to the resident's cultural belief and traditional values. Successful urban renewal programs are only visible outside the traditional walled city The nature of built up environment in the walled city of Kano is so complex and unplanned thereby making it extremely difficult for urban renewal process to be conducted smoothly. The present planning problems coupled with numerous cases of dilapidation and collapse of traditional buildings prevalent in the walled city is posing serious cause for concern for the urban environment and culture is considered to be one of the major factors hindering the success of urban renewal efforts. A total of 1350 respondents were selected via purposive and systematic sampling techniques. Major findings of the study reveal that culture and poverty are key factors why respondents oppose to urban renewal program within the city. The study concludes by recommending ways to enhance urban renewal in the walled city.



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**The historic city of Toledo (Spain), World Heritage and tourist attraction: realities, problems and tourist planning and management**

Luis Alfonso ESCUDERO GOMEZ (Spain)

The cultural tourism has emerged as one of the main forms of tourism, an economic and social mass phenomenon. This type of tourism is becoming generally more popular throughout the world. Historic centers are an important type of cultural tourism destination although they generate major visitor flows that added to the local population can create crowd situations. In this paper we'll briefly discuss about one of the main destinations of cultural tourism in Europe and Spain: Toledo. The historic center of Toledo was declared a World Heritage Site by UNESCO in 1986 because of its large cultural and monumental heritage. Its masterpieces and the proximity to the state capital, Madrid, have turned this city in a prime tourist attraction. In this paper we´ll study the main facts of this activity and the problems that resulted: predominance of excursionists, overcrowding, urban mobility difficulties, loss of identity… the local government have tried to solve these problems paying a special attention in tourist and culture planning and management. We´ll analyze the results of these policies and their achievements. Also, since some measures have been failed strategies, we´ll make a critical analysis of them.



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**Contribution of Western Travelers to Makkah "Mecca" Maps**

Ramze ELZAHRANY, Meraj MIRZA (Saudi Arabia)

Contribution of Western Travelers to Makkah "Mecca" Maps Ramze A. Elzahrany* & Meraj N. Mirza** Department of Geography, Umm Al-Qura University, Makkah, Saudi Arabia* ** Center for Geographical Analysis, Harvard University, Cambridge, USA Abstract: The holy city of Makkah has more maps than any other city in the Arabian Peninsula. It has several map atlases and many scattered map sheets. Some of these maps are more recent while others are old. Their coverage, accuracy and quality vary based on cartographic standards. The objective of the present paper is to highlight the contribution of western travelers to Makkah maps; whether it is for the city of Makkah at large, Al-Masjid Al-Haram "the Grand Mosque" or for Al-Mashair Al-Moqadasah "The other surrounding holy sites", such as Mina and Arafat. The research will select several map sheets by different European travelers during different years. Then, it will classify them according to their coverage and evaluate them professionally. Finally, the paper will offer several recommendations on benefiting from these maps in Makkah Historical Geographic Information Systems (MHGIS). Keywords: Makkah, Mecca, maps, western travelers, MHGIS



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**GIS-technologies to investigate and manage cultural landscape**

Valentina TOPORINA (Russian Federation)

According to Russian legislation cultural heritage protection includes public accounting of sites which possess signs of heritage and the registering of those sites. One of the most effective tool for the uniquely identify of the cultural landscape is the use of GIS-technologies, which allow to carry out an inventory of the cultural landscape by developing the structure of historical GIS in order to manage cultural heritage. This work is a preliminary assessment of the stability of cultural landscapes pattern. The following tasks were set: 1) to develop a typology of heritage sites in relation to the natural landscape; 2) to define a number of components which compose cultural landscapes and their surrounding; 3) to examine the current use. In the present study, using the Mapinfo Professional software, a considerable inventory material of surveyed landscapes in situ was collected. The study included several stages: 1) creation of a digital original map; 2) the translation of various objects and phenomena using appropriate options in digital form and the vector data binding to the tables that store the attribute information; 3) the choose of the base layer, containing the data set; 4) analysis of available information. Research is financially supported by grants of Russian Foundation for Basic Research (12-05-31427, 14-05-07023 and 15-05-01788)



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**Heritage production: constructing urban future on/around the memories of the past**

Yu-Chieh HSIEH, Kuang-Ting HUANG (Taiwan (China))

Neoliberalism has been prevailing through the process of the state restructuring worldwide. Nevertheless, neoliberal politics have not only affected the operation of the state, but it also informs urban governance. The culture-led development has been noticeable as a significant strategy to boost urban vitality in the post-industrial era. Heritage conservation in particular, plays an important role in achieving urban regeneration by recalling the memories and meanings of the past as a reservoir of new niches to shape the urban future. In this context, this research explores heritage conservation and redevelopment in Taipei City, Taiwan, by focusing on 'historical buildings' defined and regulated in Cultural Heritage Preservation Act. Firstly, we investigate the ways in which particular objects became historical buildings registered, as well as their categories. Secondly, the spatial pattern of historical buildings will be analyzed. Thirdly, the implications of redeveloping these historical buildings to create public spaces for citizens are also discussed. In terms of research methods, discourse analysis, GIS analysis, interview and questionnaire are adopted for adequately answering aforementioned questions. Finally, we conclude by highlighting the significance of keeping balance between maintaining and remaking cultural meanings and memories of urban heritage in the past as well as here and now, and constructing urban future.



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**Fragmented historic city centers: the case of Lleida (Spain)**

Carmen BELLET (Spain)

The Historic Centres of Spanish cities clearly reflect recent processes of urban fragmentation and differentiation. Dynamic consumption places associated with global capitals coexist with other marginal and physically degraded spaces suffering serious social problems. In the 64 ha of the central nucleus of the city of Lleida, which is one of the largest in Catalonia, there are three different Historic Centres: - The hilltop monumental ensemble (about 15 ha) which includes the medieval cathedral (La Seu Vella) and the King's Palace. This area lost its other medieval buildings after a series of wars and military occupations dating from the 17th and18th century, but its upper part is now one of the city's leading tourist attractions in the city. - The residential area built along the sides of the central hill. This area exhibits clear signs of both physical and functional degradation and since the mid-20th century has been housing many of the poorest social groups in the city. - A lower area, near the river, which has been traditionally more dynamic, housing around 400 commercial establishments. This is the main traditional shopping centre in the territory and where the main national and international brands and franchises can be found. This paper seeks to explain how this deep-seated fragmentation occurred and then analyse recent urban policies applied to the historic centre aiming to revitalize it. The most recent local policies, that have sought to dynamise the commercial activities of this area and to improve its social use through temporal events, are of particular interest.



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**Cultural landscapes: approaches to assess and provide stability**

Toporina VALENTINA (Russian Federation)

The importance of current investigation lies in growing attention to the protection of heritage in Russia. It is acknowledged that neglecting furthers the loss of aesthetic and landscape variety. Present forms of management usually mean limitation human activity that does not support the whole landscape in proper way. Cultural landscapes are not simply relics of the past, historical symbols of the Russian provinces, but also poles of potential growth, which are able to revive the province. The study has revealed that during the restoration of cultural landscapes (monasteries, estates) it is necessary to take into account two important aspects: 1) the authenticity of the restored area and 2) the potential use, investment in attractiveness of reviving cultural landscape. The sustainability of the cultural landscape is considered, on the one hand, as dynamically valuable characteristic, i.e. characteristic of sustainable use of the cultural landscape resources, and on the other hand, sustainability is a multi-criteria assessment of various indicators of sustainable development. This investigation proposes two approaches of assessing sustainability in regards to cultural landscapes: landscape (or natural) and anthropogenic. Landscape approach emphasizes the natural landscape conditions, and anthropogenic – actual cultural and historical component. Research is financially supported by grants of Russian Foundation for Basic Research (12-05-31427, 14-05-07023 and 15-05-01788)



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**Moscow: monocentric urban morphology vs polycentric city life**

Olga VENDINA (Russian Federation)

Moscow is famous for its medieval radio-concentric structure which has been extended by soviet urban planning outside of the historical center. Numerous experts consider that the inherited city morphology is a serious obstacle for Moscow urban development as the city center is a principal destination for both job and entertainment for the whole metropolitan area. While the other European cities tend to be polycentric, Moscow still keeps her inherited concentric way of urban developments and reproduces the lack of centralities in urban outskirts. This well-known discourse and conclusions affected many Russian and international studies. Nevertheless the last researches discovered that polycentrism is clearly pronounced in Moscow despite of indisputable domination of city center. People mobility and behavior reveal the secondary poles of activities. Being less important and less attractive than center itself, secondary centralities change considerably the urban space functioning. The paper brings to conclusion that there is a mismatching between the monocentric urban morphology and polycentric urban life in Moscow. The secondary centers are oriented on business activities/entertainment and they are lacking for symbolic and cultural capital. Moscow in spite of the specific soviet heritage and numerous peculiarities follows the logic of the European cities comparable in size and population number. The trend to polarization of the urbanized space, polycentrism, function multiplication and diversity growth has apparently developed. This conclusion is supported by comparison with Paris.



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## Cultural attractions in the historical cities of Havana and Santiago de Compostela: tradition and modernity

Yamilé PÉREZ GUILARTE, Rubén Camilo LOIS GONZÁLEZ (Spain)

The architectural heritage of historical cities is in itself a tourist attraction, especially in places that have been declared a World Heritage. Historically these spaces have focused tourism on offering guided tours to visit monuments, buildings or historical sites. However, current tourists are seeking to know a destination through creative and entertaining experiences. At the same time young people are taking a greater role in the global tourist demand and as such they require an offer according to their expectations. In this context, the question is how historical cities are facing this challenge, destinations which must not only ensure their competitiveness, but also the space sustainability. This paper aims to study and compare the cultural attractions offered by the historical cities of Havana and Santiago de Compostela. An analysis of its cultural offer is made by dividing the cultural attractions into two groups. On the one hand, the traditional ones, focused primarily on the contribution of cultural knowledge in a passive way. On the other, those that have proliferated in recent times in the context of cities' creativity and the emergence of new cultural tourism modalities. The results show that both destinations maintain a consolidated traditional cultural offer based on its heritage attributes. While much must be done to get a cultural proposal more innovative, entertaining and involving an experience with greater participation of visitors with local residents



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## Mont-Saint-Michel and its Bay: Natural Heritage in the Service of Cultural Heritage

Etienne BERTHOLD, Matthew HATVANY (Canada)

Over the last two decades in the field of heritage studies, research has emphasised the processes of heritage making, or "patrimonialization." A poststructuralist approach interprets patrimonialization as part of a system defined by its capacity to create signs -- a system upheld by institutions, standards, practices and values, and symbols. Thus cultural heritage is spoken of in political terms, often in ways that seek to legitimize power. Cultural heritage is historically situated and cannot be isolated from the division of knowledge into separate domains that is a feature of modern societies. From this perspective, the study of cultural heritage construction is an offspring of prior knowledge constructs. More recently, natural heritage study has come to the fore, focusing on the processes of patrimonialization of nature as an object of heritage. As Howard and Papayanis (2007: xi) remark: "viewing nature as heritage has a double impact. On the one hand it associates nature with human beings, as 'heritage' and 'inheritance', let alone 'patrimony', are highly anthropic terms (at least in this context). On the other hand, it implies a sense of responsibility of the natural wealth that has been received from our ancestors and the natural dividends that we shall leave to our descendants." From this perspective, research should pay attention to ideologies as well as prior knowledge constructs and socio-economic contexts underlying the processes of patrimonialization of natural heritage. This presentation explores the connections between cultural heritage and natural heritage through a case study of the islet of Mont Saint-Michel (MSM) and its bay (MSMB) in France. Located some three hundred meters offshore of Brittany and Normandy, MSMB comprises an area of more than 6,500 ha and has the distinction of being twice listed as a UNESCO World Heritage site for both its cultural and natural heritage. More than 2.5 million tourists visit there annually, making it the second most popular tourist destination in France. Our paper examines the heritage-making processes of MSMB from a double perspective: in terms of cultural heritage, we highlight a legacy largely indebted to the architectural, artistic and historical Abbey of MSM, which finds its roots as an object of heritage in the 19th century, culminating in its inclusion on the list of World Heritage Sites in 1979. In terms of natural heritage, we examine the processes by which the bay, specifically its tidal flats and marshes, have more recently become objects of nature heritage intended to showcase the Mount itself, like a jewel box containing a precious stone within. These dual cultural and natural heritage processes culminated between 1995 and 2014 with the design and implementation of an environmental engineering operation (Restore the Maritime Character of Mont Saint-Michel) deployed to arrest the seaward expansion of ecologically valuable tidal marshes before they engulfed MSM in the the belief that the natural evolution of the tidal marshes should be subordinated to serve the cultural heritage of the Mount itself. Our paper illustrates the clear hierarchization of heritage values taking place here, namely urban values, and the way governmental and non-governmental deciders perceive (or preconceive) of the relations between culture and nature.



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## Urban challenges in a complex world

Celine ROZENBLAT (Switzerland)

In the context of knowledge and information societies, new tendencies in the long/medium term evolution of urban systems, together with new data and methods, require that existing theoretical assumptions and conceptualizations would be challenged as global urban hierarchies are reconfigured. The connection between urban systems at different scales becomes more and more relevant for understanding urban systems and their transformations. But the inter-urban perspective is not sufficient to encompass these dynamics. Local networks are involved in macro-geographical level, mutual reinforcing of their overall radiation to other cities. Doreen MASSEY clearly expressed it for London: « the local is not only the product of the global, but that global itself is produced in local places » (2006, p.107). Therefore the reticular process operating within cities is directly related to city type of centrality at intercity level, needing to formalize further the « local buzz, global pipelines » (BATHELT et al., 2004) at the world scale. The evolution of power distributions inside and between cities reshapes the world organization of central/peripheral cities and the complexity of the global urban system. Actors as multinational firms, or high level innovation centers, participate actively to these reconfigurations that imply the concentration of wealth, of control, of innovation and of attractiveness in few cities. In the complexity of this multi-level system, how regionalization of the world is reshaping in a multipolar urban world? The methodologies derived from sciences of complex systems bring about new forms of intelligibility on these urban dynamics.



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**Evolution of Economic Geographical Structure**

Zheng WANG, Haibin XIA, Qingchun LIU, Gaoxiang GU (China)

Abstract: In this paper, Chinese spatial heterogeneity have been discussed with evolutionary economic geography. The paperconsider Krugman's geographical nature asa regional geography genes in evolution of regional graphical structure , and use it to discover the spatial heterogeneity dynamics is process of evolutionary economics. Furthermore, an analysis about the action role of the three Natures on the regional development and evolution is discussed with view of evolutionary economic geography: first nature plays the leading role in agricultural society and results in Chinese agriculture economic spatial lock in; in an industrial society, factors of second nature such as transportation and infrastructure play the key role on the regional economic development, the spatial distribution of the industry shifts from dispersion to agglomeration and Central-Hinterland structure ultimately emerges; third nature promotes regional structural change, a Hub-Network structure as a geographical structure is finally created, And it may break the locking action on Chinese geographical structure fromHu Line.



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**How The Central Place System Will Change In The Korean Peninsula If Its Parts Unite?**

Pavel EM (Russian Federation)

Germany and Vietnam united their parts in XX century, but Korean peninsula is still divided into the South and North parts. The central place system of the Republic of Korea was evolved from K=2 in 1952 to K=4 in 2011. The system of PDRK has saved the modification with K=3 from 1949 to 2008. How the central place system will change if the peninsula is to be united? There are a lot of possible ways how the situation will develop. We extrapolated the data from 1950 to 2011 and made the forecast of the population in all elements of the central place system for 2030. There will be a corridor Pyongyang-Seoul-Busan in the United Korea with K=3 and absolute dominance of Pyongyang in the North (with K=3) and axis Seoul-Busan in the South (with K=5) in case of the shared development. The index of isostatic equilibrium could be counted with equation ΣRtn/Ren=m-1, where Rt is the theoretical radii, Re – the empirical radii, n is a level of hierarchy, m is a number of levels in the settlement system after subtraction of the first level. It allows establishing a functional dependence between the spatial organization pattern of urban population and the distribution of population between heavy and light hierarchical levels. It has shown that the central place system will be more stable if the Southern and the Northern parts of Korean peninsula are not to be united.



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# The urban development companies as an element of urban spatial production: Shopping Centers in Mexico City

Dante GALINDO (Mexico)

This paper has the aim of analyzing the business and power relations, with the purpose of identifying the main actors involved in the production of an urban space that is typical of the current economic stage in Mexico. It is from the construction of the shopping centers that are displayed the main economic agents that influence the process of producing a space targeted for consumption, and furthermore, it shows the government's support for certain business groups. Indeed, the geographical study allows to identify the relationships and conflicts existing between various power groups, their negotiations and consequences. As a result, power relations are going to be a key point in the Geography's study, since they will serve to identify those main actors and the political practices and even the disputes for the space. The construction of shopping malls in Mexico City is the result of the economic stage that lives the country, in which the private sector takes the main role, at least with regard to urban planning, this is more evidenced in malls because the majority of them are built by well-known businessmen, which also has allowed them to obtain the benefits and collaboration from the local governments of Mexico City, the State of Mexico's and Federal. All these elements have allowed that, since 2005 to the present, the number of buildings of shopping malls in the city has tripled, which is reflected in a spatial production for the benefit of capital and generator of specific social problems.



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## Spatial hierarchy inside world city network

Ilya CHUBAROV (Russian Federation)

World city network (WCN) is an essential part of modern global economy, which can hardly be understood without considering its spatial aspects [Jones, 2010]. Urban approach in global studies made it possible to reveal, to some extent, networking spatial organization of world economy, and to find out its' essential nodes, which were named "world city" [Hall, 1966; Friedmann, 1986], or "global city" [Sassen, 1991]. Despite bustling development of global cities analysis (GSA) recent years, a lot of research questions still remained to be revealed, such as spatial picture of world city network. Regarding to the first, it is widely acknowledged that world cities network (WCN) has certain hierarchy (Timberlake et al, 2014), but specific of horizontal "flows" inside this hierarchy is still largely unclear. In order to understand in details composition of this network of cities, several of scheduled-rank studies been produced recently at the intersection of academic and expert consulting community. Such rankings, constructed under the strong influence of "broad" approach, now regularly presented by several major international think tanks like The Economist, AT Kearney, PWC and Knight Frank, and under (see Table 1). All rankings made by a similar procedure and cover such fields of urban development as demography, economics, culture and environment. An attempt to summarize the results of the most detailed and informative of ratings has been made in this study, based on data from Global Cities Index and Emerging Cities Outlook (2012), Global Power City Index (2013), Cities of Opportunities (2012) and Global City Competitiveness Index (2012). Score of each participant (city) was calculated by special formula. The methodology applied allows to uniform all differences between the ratings (unequal number of participants, score assessment rules, discrepancy in used statistical data), and assign a score to each city in the range from 0 to 100. As a final list included all cities with score not lower of first 27 members of each rating. As the result, 56 cities were identified, falling into 5 categories from to to down.



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**Urbanisation in Rajasthan: A Comparative Study of the Eastern and Western Plains**

Chandreyi BANERJEE (India)

Urbanisation in Rajasthan: A Comparative Study of the Eastern and Western Plains Chandreyi Banerjee Abstract Diversity is another name for Rajasthan, the largest state of India. It is the land of the Aravallis as well as the Great Thar Desert; of plains and plateaus; of scorching heat and freezing cold. This diversity present a great variation in the distribution of population in the state and the same is true in case of its urban settlements. Largely based on physical landscape, Rajasthan may be divided into four broad geographical regions, namely, the Western Sandy Plains, the Eastern Plains, the Aravalli Hill region and the Hadauti Plateau in the south-eastern part of the state. Due to scarcity of water, uncertainty of rainfall and frequent droughts, urbanisation was earlier negligible in the state and largely confined to favourable pockets. However, with potentialities of mineral occurrence, availability of power resources, development of irrigation facilities and transport and communication network, Rajasthan has registered growth in urbanisation over the years. The two plainlands- the Western and the Eastern Plains, constitute the maximum part of the state. They also comprise the maximum share of urban space and urban population of Rajasthan. Both are plainlands yet each of them constitutes distinct geographical region and their distinctness is also reflected in the nature of their urbanisation. The main focus of this study is to progress with a comparative approach in unravelling this distinctness in the pattern, growth, size-class and interrelationships of urban settlements in these two regions and how this influences the policy imperatives.



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**Urbanization in a changing context of economic growth and decline: the cases of Spanish, Italian and Greek urban systems**

Petros PETSIMERIS, Dolores SANCHEZ-AGUILERA, Stefania RIMOLDI (France)

In the history of urban studies there has been a range of contrasting evaluations and representations of the dynamics of urban systems during both periods of economic growth and decline. The aim of this paper is to analyse the dynamics of Spanish, Italian and Greek urban systems over the period 1971-2011, which was characterised by cyclical economic and urban development. The scales of analysis are the municipal and metropolitan levels. Special emphasis is given to migration, socio-demographic dynamics and housing production. Analysis of the socio-demographic components of urban dynamics helps to highlight the areas most affected by urban decline and to test the hypothesis of the relationship between economic decline and metropolitan exodus.



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**Socio-Geographical Research On Industrial Urban Systems In Ukraine**

Alexander GLADKEY (Ukraine)

Ukraine is now faced with the need to create new territorial forms of industrial activity that would be innovative, market-oriented and economically effective. There forms are developing in the base of industrial urban systems because of a specific agglomeration effect. Industrial urban system is a form of spatially concentrated industrial production complex formed on the basis of concentrated urban settlement systems and characterized by its considerable economic development efficiency that consist in the exploitation of specific economic advantages of this formation. We can define monocentric urban system in Ukraine (Kyiv, Kharkiv, Lviv and Odesa agglomerations) and polycentric one (Donetsk-Makievka and Dnipropetrovsk-Dniprodzerzhynsk agglomeration). The first ones have higher rates of economic efficiency in non-innovative commercially oriented production (food industry, timber industries, construction materials manufacturing, light industries). The second group of agglomeration (except Donetsk-Makievka one located in the war zone) is characterized by growth of economic efficiency in state monopolistic industries (metallurgy and metal production, mineral resource industry, heavy machinery). But no one agglomeration in Ukraine has high economic efficiency in innovative engineering (electronics, electrical and equipment engineering), innovative chemistry and new technologies development. Ukrainian urban systems meet only the beginning of innovative industries development (in the central core and in the nearest sub-urban belt). Our experts indicate that innovative industries have the best development in monocentric agglomerations. Dnipropetrovsk-Dniprodzerzhynsk agglomeration is expected to develop steel, non-innovative chemistry, construction materials and food industry.



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**Scenarios of the development of single-industry towns in Russia**

Dmitry ZEMLYANSLIY (Russian Federation)

Single-industry towns in Russia have been a driving force of export-oriented economic growth of Russia during the 2000-ies. However, in 2008 they have been affected by financial crisis and later in 2013-2014 by economic crisis. Economic restructuring and adverse conjuncture have led to the closure of plants or reduction of the employment in most towns specialized in mining, non-ferrous metallurgy and mechanical engineering. These processes strongly contributed to negative social situation and budget deficit. Our research was aimed at tracing the various phases in the present situation in single-industry towns in Russia and working out scenarios of their development. Our method is based on the combination of dynamics and forecast of core town enterprises and alternative urban economy. To create a scenario, we analyzed data obtained from 300 interviews with experts representing business, local and regional government, and leaders of local communities of the 18 single-industry towns in 11 regions of Russia. We elaborated three basic development scenarios contributing to overcome the low level of life in single-industry towns: «stable single-industry town», «urban shrinkage» and «industrial diversification».



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**Land Use Changes in Suburban Farming Villages in Monsoon Asia**

Kohei OKAMOTO (Japan)

One of the characteristics of urbanization in Monsoon Asia is the presence of areas that appear to be neither urban nor rural. Such peri-urban areas spread widely around Monsoon Asian cities. This is a result of institutional considerations such as city planning regulations, which are more lax in Monsoon Asia than in Europe, and the dominance of rice cultivation in the region. Because of seasonal variation in labor demand for rice cultivation, labor tends to be diverted to jobs other than rice cultivation during the agricultural off-season. Farmers who live near urban areas tend to have day jobs on construction sites, for example. In addition, the labor demand for rice cultivation decreases as a result of the introduction of agricultural machines such as tillers and agricultural chemicals. Hence, rice farmers start having additional non-farming jobs, and the features of urban life become commonplace in farming villages. Consequently, mixed land use and landscape characterized by agricultural and non-agricultural activities emerge in peri-urban areas. This paper considers land use transition in suburban farming villages in Monsoon Asia based on experiences of urbanization in Japan, China and Southeast Asian countries.



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**Regional Features Of Settlement And Urbanization Of Russian Caucasus Black Sea Coast**

Alexander KUDELYA, Victoria VORONINA, Anatoly FILOBOK (Russian Federation)

My report will focus on the transformation of population settlement of the Russian Caucasus Black Sea coast, which is located on the north-eastern Black Sea coast from Temryuk region of Krasnodar territory to the border with Abkhazia. Such delimitation is determined by the following factors: the study covers only the cities of Krasnodar territory, which are "facing the sea"; all modern statistical materials are published only according to the administrative and territorial entities. Russian border coastal zone for the purposes of integrated management is determined by the following way: from the land is limited by administrative border of coastal regions, from the sea - 12-mile zone. Thus the Black Sea region - is no longer a narrow strip of land directly bordered by the sea One of the main features of the regional settlement and urbanization of the Black Sea region is a strong predominance of large cities and developed concealing network of rural settlements, which usually resort specialization. This is due to the geographic and geopolitical position, etc., and coastal zones, the singularity of the historical development of the territory and the formation of industries. As in all coastal areas of temperate and subtropical latitudes, a trend of consolidation and compaction network of urban settlements is observed, which at the same time, is the evidence of changes in the territorial structure of industries. There is an increase of functional diversity of cities which lies in the centralization and concentration of production and capital. The system of settlement accumulated and exerts a force of inertia, making it difficult to registration in current regulation of urban growth, the settlement as a whole. In addition, the rapid development of recreation, intensive and extensor usage of seaports led to threatening rate and may have far-reaching negative consequences.



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**Social Well-Being in the Metropolitan Cities of India: An Appraisal**

Sunita KUMARI (India)

Abstract: - The term social well- being is used to evaluate the general living condition of individual and society, and forms a part of the quality of life. The term is used in a wide range of contexts, including in the fields of international development, healthcare, and political science. Standard indicators of the quality of life include not only wealth and employment, but also built environment, physical and mental health, education, recreation and leisure time, and social belonging. The purpose of study is to analysis the variation in social well-being across metropolitan cities in India. Here, the development approach incorporating certain indicators of well-being which incidentally reflect the social well-being of urban area country. In 2011 Census, there are 53 metropolitan cities in India and the evidence shows that these cities are growing faster along with the class I cities (population greater than 100,000). The conditions indicate that the analysis of the social well being in these cities is necessary for future planning purpose.



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**Transnational Migration and Socio-spatial Reconstruction of Korea towns in New York**

Jiyeon SHIN (Japan)

This study aims to understand how international demographic movement affects the global city by focusing on changes in migration movements and space of Korea towns in and near New York City, USA. This study especially focuses on the variety and changes in the global city's migrant space caused by the increase of transmigrants who arrived via multidirectional migration and still maintain tight networks with their motherlands. On-location studies were conducted in three Korea towns in New York City and New Jersey through participant observation, in-depth interviews, and discourse analysis. The results suggest that based on the time, purpose, and route of migration and identity, Korean migrants in New York can be divided into two groups: old and new comers. While the old comers have a tendency to pursue permanent migration through ethnic enclaves, the new comers have a tendency of multidirectional migration into New York City or the suburbs depending on each individual's purpose for migration and preferred living environment. Such tendencies resulted in the spatial expansion of Korea towns into three different areas in New York. Each area is distinctively identified as an ethnic enclave (Flushing), an ethnoburb (Palisades Park), or a transnational industry center (Manhattan K-town) according to the spatial interaction of the migrants of each area.



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**Globalization, Economic Transition and Industrial Location in Shanghai**

Yehua Dennis WEI (United States of America)

Producer services are traditionally considered as place-bound and clustered in city centers to benefit from agglomeration effects. However, such a pattern has been reshaped by the decentralization of service industry and the development of information and communication technology (ICT), especially for the software industry. This study investigates locational trajectories and underlying factors of software firms from 1990 to 2011 in Shanghai to detect intra-urban location trajectories and spatial dynamics. We find that location of the software industry has changed from monocentric pattern concentrated in the central city area towards a polycentric pattern with a relative decline of the core area. Using conditional logit model, the study has found that government policies, accessibility, environmental conditions, agglomeration economies and site characteristics are important determinants of location choice of software firms. In addition, the firm-level survey and in-depth interviews in Pudong Software Park show that government policy and planning, especially rent and tax incentives, have played a vital role in attracting software firms to locate in development zones.



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**The Role of Technological Innovation in the Development of Beijing**

Dong CHEN, Jie FAN, Yafei WANG, Rui GUO (China)

Beijing is the center of Chinese education and technology. However, for a long time, the development didn't relied on its technological research and development advantages.Following the reform and opening up of China in 1979, Beijing began to transform its economic development method. The advantages of technological research and development started to emerge.However, the scientific mechanism cannot effectively compel the subjects of technological innovation to give full attention to their roles in promoting economic growth. Therefore, Beijing has not yet been able to realize innovation drive.



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**The Role of SMEs Network in the Prototype Production: Case Study of "KYOTO SHISAKU"**

Akito KATO (Japan)

As the international division of labour among manufacturing processes has made progress over recent years, Japanese MNEs strengthen R&D function in Japan. In accordance with such a trend, SMEs not only support product development by MNEs through offering prototype production functions, but also survive through enhancing their own development and/or technical capabilities. Recently, in Japanese industrial districts, there are trends of establishing organizations related to prototype production. This presentation shows the current situation of prototype production by SMEs in Kyoto, by analyzing the attempt of network organization "KYOTO SHISAKU" as a case study. KYOTO SHISAKU was established by 10 SMEs related to machining and metal processing in the southern part of Kyoto Prefecture for the purpose of prototype production in 2001. Then 27 major companies and financial institutions invested KYOTO SHISAKU in 2006. Today, about 100 SMEs participate in KYOTO SHISAKU. The main work of KYOTO SHISAKU is to act as an agent of prototype production between KYOTO SHISAKU's member companies and clients. The number of transaction is approximately 1,200 in 2014. Main clients are the major companies in Kinki Region including those which invest KYOTO SHISAKU. Contents of the operations cover not only processing but also design and post-processing. For the client including major companies, KYOTO SHISAKU has yielded a reduction of outsourcing management cost, which is a kind of transaction cost. On the other hand, for the member companies, KYOTO SHISAKU contributes expansion of business partners as well as expansion of scope of business for instance design and/or development through developing prototype.



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**The geography of the knowledge-based economy in Bavaria: a cluster approach**

Anastasia NOSOVA (Russian Federation)

The interactive model of innovation in the knowledge-based economy is built on localized knowledge spillovers among actors within geographical clusters. The article discusses the evolution of high-technology clusters under the influence of knowledge spillovers formed as a result of migration of highly skilled specialists who grounded their companies in Bavaria and put their knowledge into practice. The study was conducted on the example of biopharmaceutical (Munich) and medical equipment (Erlangen-Nuremberg) clusters using the data on professional development paths of firm managers. A relationship between the change of the role of different sources of knowledge spillovers and locational conditions of high-tech companies was revealed. In 1950 - 1970s, when large high-tech enterprises had been moved to Bavaria from other federal states, the external knowledge of experts from other regions and countries or Bavarians, who studied or worked abroad, was determinant. Subsequently more firms were established by entrepreneurs who acquired knowledge in Bavarian companies. In the 1990s with the beginning of cluster policy the importance of access to financing and specialized infrastructure, and afterwards to a wide range of actors of the innovation process for obtaining specialized knowledge has increased. The share of firms grounded by representatives of Bavarian research institutes and universities and local knowledge acquired in the region have risen. In the cluster of medical equipment the entrepreneurs' experience obtained in Bavaria was more important all the time due to the domination of more codified knowledge in the industry. It is argued that the results of a cluster policy depend considerably on forming of interactive model of innovation through support of knowledge spillovers.



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**The spread of new technologies and the configuration process of the smart cities in Galicia**

Francisco Xosé ARMAS QUINTÁ, Xosé Carlos MACÍA ARCE (Spain)

Advances in the spread of new technologies in Europe have been of great importance despite the major differences between countries. Progress has been greater in regions that have seen much more delayed start, especially in those requiring the adequate connectivity and equipment to access the network. However, much remains to be done if full immersion in the Information Society is to be achieved. Although much of the population makes basic use of the Internet, there is hardly any use of the advanced services on offer. It is a necessity to talk about a new digital divide between Internet users who use these types of advanced services and those who do not. This fact must be overcome if the establishment of Smart Cities is to be achieved. Therefore, the use of advanced Internet services and the second generation digital divide in Galician urban areas and hence their role in the process of shaping the Smart Cities is studied in this paper.



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**Sustainability of Urban Environment: A case study of South Delhi District, India**

Mohd. ISHTIYAQUE (India)

The rate of growth of urbanization in the developing countries is higher as compared to many developed countries of the world. The main reason behind such a high growth is basically economic. Infrastructure facilities, availability of educational institutions for higher studies, better health facilities and also to certain extent the relaxation from traditional social taboos may be held other important factors for people migrating from rural and urban. Such a rural-urban migration has been resulting congestion and affecting the urban environment. Deterioration on all counts including physical, atmospheric and cultural environment is clearly visible in cities especially in million cities of India. The paper highlights the case of South Delhi. The Delhi Government has taken some measures to decongest the migrant population who were living in shanties and slums across the district and also trying to maintain a suitable urban environment. To examine the government's effort in order to understand the consequences of displacement and rehabilitation of the slum dwellers, and intensive field work was conducted during 2006-2007 in the district. Efforts were made to survey all the slum/shanties on various socio-economic and environmental parameters. Both displaced and rehabilitated colonies of the district were surveyed. The results of the study reveal that through efforts of the government towards improving the quality of urban environment have brought some positive changes, the move was not found in the larger interest of the slums dwellers. It was found that a there exists a great loss to the government exchequer as well as the precious piece of land which could have been used for further industrial development on the out skirt of the NCT (National Capital Territory) of Delhi. Study also revealed that those slum dwellers who have not yet been displaced were found enjoying better quality of life than the people shifted to the resettled colonies. Finally, the paper presents a proposal for an alternative solution for managing the migrant population and their slums as well as providing a sustainable urban environment in the study area.



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**Global City, Neoliberal Urbanism and Social Exclusion: Urban Question in Millennial Delhi**

Dhiraj BARMAN (India)

The third world megacities represent essential contradictions with its northern counterpart. Global city has become a strong meta-narrative for the third world urban policy makers in present globalising world. Global city largely means making beautiful city with global investment potentials. It largely embodies neoliberal urbanism; where gentrification and social exclusion held to be important strategies of it. Like many third world cities capital Delhi also became a prime site of such hyper urbanism processes. Global city as a western mode of urban development cannot be panacea for emerging economies; rather it is highly exclusionary in nature. In Delhi's context such urbanism processes are going at a faster rate through ignoring many other social development issues. The real-estate is booming and rampant slum evictions have taken place. The government policies in recent past are trying to overlook the priorities for the common citizen; different exclusionary methods are being used to keep away the unwanted social class from the city through gradual withdrawal of civic amenities and regularising urban social landscape. The objective is mainly to understand the neo-liberal urbanism process. The study tries to engage with emerging urban theories like new urban policy, hyper urbanism; while validification of these concepts will be based on different secondary data and narratives collected from the field as well as other published sources. [Key words: Global City, Social Exclusion, Gentrification, Neoliberal Urbanism]



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**Child Labour: A Multidimensional Social Malaise**

Keshari Prasad (India)

Children are our national wealth and future of our society. The prospects of a nation are decided by the development, progress, advancement and well-being of the children. Hence every society is expected to create a favourable environment and give adequate opportunities for the proper development of the potential of its children. Unfortunately, a major section of children is engaged in such activities which are hazardous to their life and health. Child labour is work performed by a child that is likely to interfere with his or her education, or to be harmful to their health or physical, mental, spiritual, moral and social development. It is a social evil and one of the greatest social malaises which oscillate towards the underdevelopment of the economy without supporting qualitative population growth. It comes with so many dimensions and is deeply rooted in the socio-economic structure of the society. The present study encompasses an in-depth analysis of trends, magnitude of working children and their socio-economic determinants in Andhra Pradesh, India. In the present study, an attempt has been made to analyze the causal relationship between child labour and its various socio-economic determinants. To show the probability of being Child Labour, Logistic Regression has been used. It was noticed that vulnerable, socially and economically backward groups are more exposed to child labour. It is found that poverty is one of the most prominent affecting variables of child labour. Implementation of Policies and programmes are more responsible to curb the incidence of child labour. Keywords: [Child labour, problems, determinants, policies]



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**Contested Social Spaces: How Caste and Religion Matters in Urban Housing in Metropolitan India**

Anuradha BANERJEE, Anita BHARGAVA (India)

The diverse social fabric of metropolitan cities has led to contestations and conflicts among population groups. Discrimination or 'unequal treatment of equals', based on caste and religion, remains a persistent problem in Indian cities and the urban rental housing market is no exception to this. The present paper proposes to identify systematically the processes and map the extent/levels of discrimination experienced by the Dalits (Scheduled Caste) and the Muslim community vis-à-vis upper caste Hindu in urban rental housing market in selected five metropolitan cities in the National Capital Region (NCR). Based on a review of methodology development in the US, the sample design consists of a study of five metropolitan cities in the NCR viz. Delhi, Faridabad, Ghaziabad, Gurgaon and Noida. Audit methodology viz. telephonic/mobile phone audit; in-person or face-to-face audit and recording of experiences through Case Studies have been applied to capture existing inequalities/unequal outcomes in rental urban housing market. Findings reveal that direct suppliers or landlords themselves are involved in the act of discrimination, though there are contextual differences between the Dalit and the Muslim. Discriminatory behaviour has been also revealed during the in-depth interviews with the landlords that vary spatially/geographically. In fact a vicious cycle of discrimination and differential treatment persists through the landlords, real estate agents and brokers resulting in residential seggregation and ghettoisation. Caste and religion based discrimination is rampant as revealed through the case studies conducted in each selected city ultimately manifests in unequal outcomes among population sub-groups.



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**Makeover Of Selected Urban Villages In Delhi, India: The Dominant Role Of Transportation Lines**

Anjana Mathur JAGMOHAN, Jag MOHAN (India)

Urban villages, located along the major transport corridors in Delhi are perpetually in a stage of transition. Villages that are part of the proposed urban extension area or fall within the existing urban area, also faces the threat of losing their character or identity due to the market forces. The urban villages of Delhi carry 5-6 times more the population density than the non-village areas and caters for mixed land use, with residential, commercial and also, industrial (small or household industries), based on the demands of the surrounding localities. "Unfortunately, the urban villages suffer from a lack of infrastructure such as sewerage, water, power supply - due to non development of infrastructure within these areas. The acuteness of the situation is magnified by the high population densities, and leads to horrible living conditions during periods of seasonal stress as in high summer or heavy rains." (Hindustan Times, 24 May, 2003, hindustantimes.com). The study area of east Delhi is very vast. There are national highways passing through it (GT road cuts it through the middle). But accessibility to the villages varies from area to area. Three villages form the study area have been chosen to show case the transition of a rural area into a totally urbanized village due to the dominating role played by the proximity to metalled roads. The three villages - Badarpur Khadar, Garhi Mendu and Shamaspur Jagir- represent the three stages development of a village into an urban area respectively- its rural stage; the middle stage and the totally urbanized stage. The locations of the villages are slightly away from the main road, slightly away but an important road passing through it; and the third village is located on the main National Highway 24. It is a totally urbanized village with little or negligible agricultural land remaining. The paper highlights the unmistakable differences in the skylines, landscapes and the resident socio-economic character of the population brought out through personal interviews and pictures. The paper also tries to suggest policy decisions so as to level out the differences in villages and their planned overall development. Keywords: transport lines, differential urban transformation



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**Homelessness Impact On The Quality Of Urban Social Environment**

Mirela PARASCHIV, Ioan IANOŞ, Irina SAGHIN (Romania)

Urban poverty constitutes a significant challenge for the sustainable development of cities as it directly impacts the urban environment. Homelessness stands out as the extreme expression of urban poverty, associated with multidimensional forms of exclusion and a specific interaction with the urban territory. Romania gathers one of the highest rates of homelessness among the other European countries, while, at national level, Bucharest represents the urban area that concentrates both growth and increased poverty. The study conducts a qualitative assessment of the social environment in Bucharest, based on the relation between homelessness and the general population. The empirical analysis included a direct survey among the urban dwellers to highlight the territorial interactions established between the general population and homelessness with a focus on the homelessness impact on the quality of urban life. The results of the analysis evidenced the relationships established between the homeless people, the territorial manifestation of homelessness and the general population. The main findings argue that homelessness intervenes in the degradation of urban social environment while it participates in the generation or intensification of existing social problems in the city. Based on the identification of main social issues in correlation with homelessness in the territorial framework of Bucharest, the analysis' conclusions provide helpful knowledge for the urban planners and policy makers to increase the quality of urban social environment and to support the sustainable development of the city.



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**Asymmetry of Culturally Contested Urban Spaces in Israel: Ultraorthodox versus the Non-Orthodox Jews**

Amiram GONEN (Israel)

Most urban spatial contests discussed in the scientific literature are mostly based on race, ethnicity, religious denomination or socioeconomic status. Such contests take place in Israel, but there is an additional one based on religiosity – the one between ultraorthodox and other Jews. This contest is asymmetrical, many neighborhoods being won over by ultraorthodox. There are several reasons for this asymmetry: (a) Ultraorthodox high birth rates generate high growth and high demand for additional residential space; (b) Ultraorthodox preference for a homogeneous cultural milieu of their own directs their residential demand to adjacent neigbourhoods; (c) Being able to walking to the synagogue and relatives, enhances ultraorthodox willingness to pay relatively high prices for available adjacent housing options. The settling of ultraorthodox households in these neighborhoods is often associated with high level conflict. As ultraorthodox residents in newly-settled adjacent neighbourhoods reach a tipping point), non-orthodox exodus surges appreciably, fearing the turning of the neighborhood into an imposing ultraorthodox cultural "territory". Efforts are made to reduce spatial contest by syphoning Ultraorthodox residential demand by leapfrogging en masse to newly-established separate ultraorthodox neighborhoods and even towns. However, this policy intensifies spatial segregation between ultraorthodox and non-orthodox Jews.
Keywords: Israel, urban spatial conflict, asymmetry, ultraorthodox, non-orthodox, segregation.



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**New urban spaces, young people and liveability: Ecological transition**

Margaret ROBERTSON (Australia)

The capabilities of young people as citizens will shape our urban cultures and support our ageing demographic. New inner and outer urban spaces of our rapidly expanding megacities are different social contexts. Their affordances for daily life and perceptions of liveability for young people are largely unexplored. Knowing how the millennial generation is influencing their ecology is critical for aligning policy responses related to urban design, health, education and employment opportunities. Our research with adolescents, aged 12 – 15 years (N=645), in the Australian city of Melbourne (and supported with findings from previous research in Finland, The Netherlands and the United Kingdom) highlights the merits for wellbeing and civic identity of nature spaces; mobility including ready access to public transport, and building community relationships. Advocacy for youth voice in the planning process is increasingly being recognised as an integral part of sustainable urban design and policy.



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**Segregation and concentrated urban poverty in Cape Town**

Herman GEYER, Faizel MOHAMMED (South Africa)

Urban poverty is a serious challenge in the management of cities. Of particular concern is the spatial concentration of extreme poverty resulting in the intensification of economic hardship and the social marginalisation of these communities within the city. Middle class flight compounds neighbourhood decline (Wilson, 1987). This results in hypersegregation, in which impoverished neighbourhoods experience increasing demographic homogeneity and segregation (Massey & Denton, 1993). While the problem of spatially concentrated urban poverty is common throughout the world, it is particularly acute in South Africa due to historical legacies, rapid urbanisation rates and high income inequality rates. To further understand the dynamics of spatially concentrated urban poverty and hypersegregation, the study analyses concentrated urban poverty and changes in the poverty levels of neighbourhoods in the Cape Town Municipal area between 2001 and 2011. The study will also review the spatial changes in the distribution of neighbourhood poverty in Cape Town over the study period. The study identifies important trends in neighbourhood poverty and analyses the socio-economic factors linked to neighbourhood change in the disaggregated subpopulations. The study is particularly focused on the factors related to the concentration of highly impoverished neighbourhoods evidence no change in poverty levels. Study will also analyse a large group of high and moderately impoverished neighbourhoods which evidence fluctuations in poverty levels without clear improvement or decline, as well declines in neighbourhood poverty in a large group neighbourhoods with low poverty rates in 2001. The study's premise is that changes in neighbourhood poverty within Cape Town are predominantly influenced by environmental conditions due to economic processes external to the neighbourhood. Moreover, it is expected that changes in neighbourhood poverty levels are also strongly influenced by social changes internal to the neighbourhood and political choices affecting the neighbourhood in terms of specific area-based interventions and the regional side-effects of national economic policy. The study is of practical value in analysing the factors influencing spatial processes of hypersegregation in which highly impoverished neighbourhoods are increasingly concentrated. Although the process of hypersegregation is often studied as a demographic event, the causes and effects of hypersegregation is not well defined. To accomplish this study evaluates views on the effects of environmental conditions, structural changes in society and policies on hypersegregation. Comparatively little research has been done regarding neighbourhood



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change in South Africa compared to work done in the North. There is insufficient information regarding the longitudinal trajectory of neighbourhood poverty, and whether integration or polarisation is occurring in South Africa. Although studies on the north indicate that long-run integration is occurring with an absolute decline in the number of and population in impoverished neighbourhoods, it is not certain that these trends also apply in South Africa. There is also very little information regarding the socio-economic characteristics of neighbourhood change (Galster, 2002). Moreover there is a lack of large-scale studies in which the impacts of wider changes and spillover effects can be investigated directly (Lupton & Power, 2004). This study is also the first to use subplace boundaries harmonised between 2001 and 2011 for descriptive statistical analysis of neighbourhood change within a South African city.



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**Differences in contemporary gentrification between a capitalist city and a post-communist city**

Yoshihiro FUJITSUKA (Japan)

Gentrification has undergone change since Glass's first report on London. Gentrification is no longer confined to Western major cities. After the collapse of the Berlin Wall, Eastern European countries changed from a communist to a capitalist economic system. In the 1990s, gentrification occurred in these nations because of the restitution of requisitioned properties in post-communist cities. Public support for privately financed modernization caused the displacement of the original tenants. Since most buildings have been rehabilitated in the 2000s, the local manifestations of gentrification have changed. Regulations for rent levels have been removed, and social exclusion has more proceeded. Capitalist countries experienced economic recession in the 1990s. Afterward deregulation policies were enacted to revitalize low-utilized land areas near the city centers. Large-scale condominiums have been constructed at these sites, and have led to rent increase in the 2000s. New forms of gentrification have remade the central urban landscape as elite enclaves. In the 2000s, the post-communist city has experienced a new phase of gentrification through the deregulation of urban policy. Globalization has also increased the number of their high-income residents. This paper elucidates the differences of gentrification between a capitalist city and a post-communist city in the 2000s. The paper also compares the geographical restructuring of gentrification in both cities.



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# Changing ethnic neighborhood and social relations among local entrepreneurs in Toronto's Little Portugal

Koki TAKAHASHI (Japan)

This paper aims to empirically clarify the process of neighborhood change in Toronto's Little Portugal, a neighborhood now facing gentrification, by focusing on local entrepreneurs and the social relations among them. The paper primarily examines how existing ethnic groups and newly arriving gentrifiers interact in a traditional ethnic neighborhood experiencing gentrification. Empirical data were accumulated by field surveys, including a land use survey, interviews, questionnaire surveys, landscape observation, and document surveys conducted in 2012 and 2013. The Little Portugal Business Improvement Area (BIA) was chosen as the geographical analysis unit. Non-Portuguese businesses have replaced Portuguese businesses in the past decade; in the BIA, Portuguese and non-Portuguese entrepreneurs can now be found in almost the same numbers. I visualized their social relations by using a diagram called a sociogram; the diagram visibly demonstrates that Portuguese and non-Portuguese entrepreneurs are socially divided but spatially inseparable in the neighborhood. The BIA board, an organization for community development spearheaded by local entrepreneurs and property owners, has shifted to become predominantly non-Portuguese. The social relations among non-Portuguese entrepreneurs affect and are affected by the activities of this organization. However, Portuguese people remain property owners. The adherence of Portuguese property owners to a place that is tied to their immigration history may partially protect this ethnic neighborhood from gentrification.



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**A Spatial Analysis of Food Deserts in Toronto Metropolitan Area**

Shuguang WANG, Hong CHEN (Canada)

This paper presents a spatial analysis of food deserts in metropolitan Toronto. Circular trade areas of 200 discount supermarkets are created with radius of 0.5, 1.0 and 1.5 kilometers respectively (which are used by different researchers as fair walking distance for pedestrian shoppers). The number of persons who live in low-income households and outside these trade areas is then calculated to gauge the social impacts of food deserts. The study found that food deserts do exist in metropolitan Toronto. Depending on the various access measurements, the number of affected persons ranges from 330,000 (using 1.5 km as fair walking distance) to 726,000 (when 0.5 km is used). While most of the affected persons are found in the inner city and the inner suburbs (particularly in the socially deprived neighbourhoods), the outer suburbs are not immune to food deserts. Although the many ethnic food stores help to fill the market gaps, their cultural suitability for some of the affected persons needs further investigation. The current distribution of the discount supermarkets is not in a socially just manner, and food retailers are called upon to assume more social responsibilities and consider providing equitable shopping opportunities for all consumers. Appropriate land use policies are also needed to guide future store developments to improve health, productivity and general prosperity of all members of the metropolitan region.



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**Evolution of urban socio-spatial structure: the case of Guangzhou**

Jincan HU, Chunshan ZHOU (China (Beijing))

Most of the research on urban socio-spatial in Chinese cities have focused on the socio-spatial structure in a certain time. This paper aims to research the evolution of Guangzhou for nearly 25 years, mainly using the housing survey of Guangzhou in 1985, the fifth population census data of 2000 and the sixth population census data of 2010. Our findings reveal that the types of social areas have been experiencing 15-year transformation and trending stable in recent 10 years. However, the spatial evolution of social areas has gradually strengthened. The evolutional characteristics of social-spatial structure from 1985 to 2010 are summarized as following: the old urban core degenerating; mixed residential areas of the locals and immigrants expanding outward; aggregation areas of educated people in the central city weakening; mixed areas of the locals and immigrants taking place of agricultural people in nearby suburbs.



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**Public versus private housing: impact of ownership on Berlin's social structure**

Robert KITZMANN (Germany)

Housing privatization in Germany was heavily pursued after unification in the 1990s. Berlin, which once was the stronghold of public housing in the early 1990s, became the centre of housing privatization due to the decision of national and local policy makers. Compared to other European countries, which sold public housing units mainly to former tenants, the German approach was characterized by en-bloc sales of huge portfolios and entire companies to Anglo-American investors, who were interested in financial returns rather than in sustainable stock management. The critical discussion of this process highlights social consequences for tenants of the privatized stock by increasing the rent and displacing low-income tenants. This contributed to the segregation by income and owner type where low-income households reside in public stocks and wealthy tenants in private stocks. However, the statistical analysis reveals no dependence of the social structure (measured by e.g. unemployment, recipients of transfer payments) of the city's neighbourhoods from the presence of public or private housing units. Instead, the social fabric of neighbourhoods is determined by location within the city, with higher unemployment shares in peri-urban areas. Thus, provisions focusing on public housing, like the "Alliance for social housing policy and affordable rents", initiated by the Berlin Senate and the six municipal housing companies, will fall short to overcome the current tension on Berlin's rental market, characterized by a crisis of affordable housing in the inner-city areas.



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**Understanding the Umbrella Movement: An Urban Morphological approach**

Michael CHAN (China (Hong Kong))

In 26 September 2014, Hong Kong has started her peaceful civil disobedience movement against the decision made by the Standing Committee of the National People's Congress (NPCSC) on rejecting the "True universal suffrage" to the Chief Executive on 2017. Over ten thousands of individuals participated in the protests and resistance against the Hong Kong Government and Police Force in the "Umbrella Movement", making it one of the major world concerns in the year. Apart from political issues, the Umbrella Movement is characterized by its long (over 79 days) and unique form of geographical existence within the major districts (Admiralty, Causeway Bay, Mong Kok, and Tsim Sha Tsui) in the city. In relations to the differences of urban morphological characteristics, these "Occupied Zones" have faced different situations (Triad involvement on attacking the protesters, differences on Police's eviction and Court's injunctions orders, etc.) during the movement. This research is aimed to conduct an urban morphological study to the 4 named Occupied Zones during the 2014 Hong Kong protests. Three key questions are examined: 1) To what extent how the compact city block pattern favors/weakens protests? 2) How do the different road network patterns affect the social movement development? 3) What are the relationships among the urban design, usages, social classes, residents and the protesters in different Occupied Zones? It is believed that such assessment can offer insights to the future trends of social movement development, and a better understanding to the future social action mechanism.



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# Site Suitability For Solid Waste Disposal By Using Geoinformatics For Pune City Of Maharashtra, India

Ravindra G. JAYBHAYE (India)

Solid waste management is among the basic essential services provided by municipal authorities in the country to keep cities clean. The processes of industrialization, rural to urban migration and high growth rate of population have induced rapid urbanisation in developing countries and obviously in India also. The haphazard urbanisation created acute problem of solid waste management. The per capita waste generation rate in India has increased from 0.44 kg per day in 2001 to 0.5 kg per day in 2011; such a steep increase in waste generation within a decade has severed the stress on all infrastructural, natural and budgetary resources. Pune is one of the fastest developing city and consequently per day total quantity production of solid waste is also increasing, presently it generates about 1300 to 1400 metric tons per day. There is only one site for the disposal of the solid waste generated in the city. But due to mismanagement of the disposal, problem of bad odor, fire, groundwater pollution and spreading of waste in the area caused unhygienic condition around the disposal site. It has triggered strong oppose from the local people. So, there is need of the proper waste collection and disposal system and most important suggest new suitable sites for the disposal. The proposed work emphasizes on the assessment of detail process of solid waste management and suggests site suitability for solid waste disposal by using Geospatial tools like RS, GIS and GPS. It may helps in sustainable urban planning of the Pune city.



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**Sustainable Solutions To Urban Tribulations – Unearthing Energy And Livelihood From Solid Waste In Ghazipur, Delhi, India**

Jag MOHAN, Anjana Mathur JAGMOHAN (India)

According to the Delhi Pollution Control Board, the 13.8 million persons residing in the Municipal Corporation of Delhi's zones, produce about 7000 Tons of solid waste per day. About 6500 Tons of this waste is collected and carried to the Solid waste dumping sites in Delhi like the Bhalaswa, Okhla and Ghazipur Landfill sites. The present study is limited to the Ghazipur Land fill site, spread over 31 acres and located just on the border of Delhi and Uttar Pradesh in Ghaziabad. The 6500 Tons of daily waste has created a mountain of solid waste in the area. The average height of the landfill site is 25.5 metre, while at some point, it touches 30.5 metre. The site came into operation in 1984 and no effort has been made to turn the waste. Together this waste has been lying at the same place. The mountain of solid waste has a slaughter house located just next to it. The Slaughter house is the only legally run butcher house for the city where more than a 1000 goats, 5000 chickens are cut every day. The waste from here automatically finds its way to the land fill site across the small road. Together – the Ghazipur land fill site and the slaughter house provide a deadly concoction of meal for about 5000 eagles and about 100 vultures daily- who sit perched upon the passing overhead wires, power poles and the adjoin buildings. Water from the land fill site has been polluting the ground water below for as long as it has been in operation. It is only recently that some development is taking place in the Municipal Corporation about the profitable and constructive utilization of this solid waste. For this an effective power from waste plan has been drafted and has been put into action. A waste-to-energy plant being set up by the Delhi Power Department through the East Delhi Waste Processing Co. Ltd (EDWPCL) at the Ghazipur landfill site. "During the first phase, the garbage will be converted into refused-derived fuel (RDF) and will be sold to various industries for its utilisation as fuel. In the second phase, the RDF so generated at the plant will be incinerated there itself to produce 10-12 MW of green electricity. The East Delhi Municipal Corporation in compliance with a concession agreement signed with EDWPCL is required to supply 1,300 metric tonnes of garbage at the collection point of the plant. The Ministry said the civic body had already provided a piece of land measuring about 10 acres to Gas Authority of India Limited for setting up of a pilot project for extracting methane and other gases from the Ghazipur dump site. The gas so extracted, if found of sufficient calorific value, will be utilised as fuel in various types of vehicles and if not, the gases will be flared up. The construction work of this plant is in an



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advanced. This information provided by the Ministry of Environment and Forest indicates a growing need to adopt path-breaking energy conservation innovations in our daily lives and also to maximize the benefits from the waste generated from urban areas. There is also a plan to cover the area of the land fill with soil and grass and develop it into a park and a picnic spot, thus increasing the green cover of the already green city. The present study not only deals with the environmental implications of the land fill site- so essential for an urban area bereft of proper waste disposal mechanism, but also delves deep into the implication of the present environmental situation and the envisaged environment on the surrounding population and the directly affected population of the ragpickers. The present situation provides them with a source of livlihood which is likely to be affected by the planned changes. The study conducted among the 100 local residents (vicinity) and 50 ragpickers found that while the urban local population welcomed the changes planned, the rag pickers are the worst affected and need immediate rehabilitation, help and vocational training. Keywords: Land Fill Site, Slaughter House. Solid waste, Energy from waste



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**A Spatio-Temporal Analysis Of Urbanization In Panchkula, Haryana(India)**

Rohtas GODARA (India)

A Spatio-temporal Analysis of Urbanization in Panchkula, Haryana (India) Rohtas Godara, Assistant Professor , Department of Geography, Govt. P.G. College, Panchkula, Haryana, India ABSTRACT Urbanization refers to the growing concentration of population in cities, towns or conurbations which can be attributed to rural-urban migration, emergence of new town or up gradation of area into an urban area. Today more than half of the world's population resides in urban areas whereas in case of India it's above thirty percent. But as per the census of 2011 the absolute increase of population is more in urban areas in comparison to rural areas. The latest census of 2011 reveals that about 55 percent of the total population of Panchkula resides in urban area which is above the national average. This phenomenal growth in urban population and resultant urbanization is attributed to proximity to Chandigarh periphery area which experienced tremendous socio-economic and physical development of infrastructure and the recent spurt in real estate activities. All these factors in conjunction pressed in for planning the expansion of the urban area. But in recent time cities have become places of urban environmental degradation which is detrimental to generations both present and future. With rapid expansion of urban population around the world there is growing awareness about minimizing the environmental costs of urbanization. The study is based on secondary data collected from various sources. The objective of the study is to present spatial and temporal analysis of the urbanization using simple cartographic techniques. The concept of sustainable development shall be kept in mind while policy makers plan to develop any region particularly an ecologically fragile area like Panchkula. Keywords: Urbanization, population, growth, planning, expansion, environmental.



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# The Spatial Production Of The Uneven Distribution Of Water In Periurban Settlements In Tijuana, Mexico Caused By Power Relations

Circe BADILLO (Mexico)

With a growing population and economy, Tijuana is one of the most dynamic border cities in Mexico. This situation gives it unique characteristics in regards to the population distribution, increase in water use and wastewater. All these factors represent a major challenge facing the major urban problems. The population growth, fostered by the presence of manufacturing industries called ”maquiladoras” created due to the Free Trade Agreement (NAFTA: North American Free Trade Agreement), has increased the demand of water services, and has resulted in a belt of suburban settlements where thousands of people live without piped water or an appropriate sewer system. The majority of population growth takes place in informal settlements (and quite often illegal) characterized by poverty. The residents are the ones who have provided, constructed, maintained and improved health and water services. There are also private sellers who are the ones that supply water and not the local authorities, who generally ignore these areas. This sector also subsists with a volume of water below the limits recommended by the World Health Organization (40 liters per capita per day) resulting in health risks. Water management is based on power relations as there is a preference for supply water to the industries before periurban settlements.



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**China's new generation migrant workers' urban experience and well-being**

Shenjing He, Yuting Liu, Kun Wang

Among the tens of millions of migrant workers in Chinese cities, new generation migrants have taken up a substantial proportion. Yet, their distinction from the older generation and their unique urban experience and their well-being have not been fully explored in existing literature. Referring to Bourdieu's concepts of field and habitus, this chapter is to unfold the stories of China's new generation migrant workers through examining their predicaments and well-being, changing imagination and representation of city and home, and life prospects under a confluence of forces from the state, market and society. Compared with the first generation migrants, the new generation is better educated, and is more willing and adaptable to stay in the city. Unlike their predecessors, most of them do not have farming skills, while are more creative and full of adventurous and enterpreurial spirit. Nonetheless, their urban lives suffer from the same level of precarity as their predecessors do, sometimes even worse, since the rigid hukou system and rural-urban dichotomy endure, while competitions among themselves become much fiercer. In the highly unequal and contested urban field, self-stigmatization and ambiguous identity are the common"habitus"for new generation migrants, and reflected in their imagination and representation of the city and home. To a large extent, the field and habitus faced by migrants are shaped by state institutions. Yet, market and social forces have added new dimensions to migrants' urban experience.



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**Changes in urban green spaces of Kolkata using satellite data**

Mishra PRAVEEN (India)

Green spaces play important functions in urban environments. Reducing air pollution, providing shade and habitat for arboreal birds, producing oxygen, providing shelter against winds, recreational and aesthetic qualities and architectural applications are the main functions of urban green spaces. With the rapid change of urban area in Kolkata city during the past decades, green spaces have been scrappy and isolated causing destruction and dysfunction of these important urban elements. The objective of this study was to detect changes in extent and pattern of green areas of Kolkata city. In this research, we classified a Landsat TM and an Landsat ETM image belonging to the years 1993 and 2013, respectively. I then used a post-classification comparison to determine the changes in green space areas of Kolkata city during the 20 years covered by the images. The results showed that during 20 years from 1993, a significant decrease had occurred in the extent of urban green spaces with a concomitant fragmentation resulting in downgrading and destruction of the functions and services these areas provide. We conclude that the general quality of life in the central parts of the city has been diminished. We also state that a combination of remote sensing image classification, landscape assessment and vegetation indices can provide a tool for assessing life quality and its trend for urban areas.



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**Creating city sustainability by means of realization of the concept of urban resilience (on the example city of Tyumen, Russia)**

Liliia SULKARNAEVA, Dmitry MARINSKIKH (Russian Federation)

The transition of the science to post-non-classical stage of development creates a new understanding of the city as a complex system with the focus on its development and its future states prediction. Supporting sustainability becoming is quiet difficult due to the urbanization processes and complex character of the city system, which includes economic, social, cultural, environmental, industrial subsystems. Because of overestimation of some subsystems and underestimation of others, the whole system accumulates imbalances, which lead to system's insecurity. Moreover, the fact, the city is an open system, influenced by natural and socio-industrial environment, make sustainability be tackled at the regional and national level. However, using the main ideas of concept of urban resilience, such as perception of the city as a whole system, finding internal resources of the city, leads to resolution the most problems of providing city sustainability at the urban scale. We believe that if city's sustainability highly influenced by the state of urban landscape, right governance decisions to urban landscape planning, architecture and construction works will provide sustainable city development. Governance policy to urban landscapes should be based on theory of ecosystem services, which serves to reveal valuable, vulnerable and the most common landscapes by valuation of ecosystem services, providing by these urban landscapes and should consider interests of all city's subsystems. This approach would lead to creating resilient city, capable to respond to and recover from significant multi-hazard threats with minimum damage to public safety. Possibilities of urban resilience concept realization by means of ecosystem services valuation are shown on the example of city of Tyumen, Russia



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**Challenges to global urban remote sensin: temporal-structural models**

Victor MESEV (United States of America)

Rapid global urbanization and disruptive environmental changes are most accurately measured and more consistently monitored using remote sensing technology. Following an international workshop, which identified land use, temperature, and air quality as critical conditions for measuring sustainable urban growth at the global scale, this paper will build on the workshop's scientific findings by expanding research on the crucial role that spatial-temporal resolutions of remotely sensed data play when monitoring the geographical spread, density, quality, and environmental impacts of human habitation. What this talk will introduce is a theoretical framework that encompasses the spatial and temporal properties of urbanization, investigating the juxtaposition of residential, commercial, transport infrastructure with environmental indicators of temperature and air quality, and the planning lags of municipal policy with actual urban development. Data from earth observation sensors, GIS, and ancillary demographic sources are combined into time-dependent urban structural-functional integrative models. These models assume two time periods (T1 and T2) formulated by combining urban structural patterns (derived from classified remote sensor data) post T1 as T1+1 and post T2 as T2+1 and urban functional demands and decisions (derived predominantly from GIS data, population censuses and urban plans) pre T1 as T1-1 and pre T2 as T2-1 respectively. The relationship states that decisions and trends in urban functions at T1-1 determine the type and density of urban structure at T2-1. A temporal complete strategy is essential if world cities are to be monitored with any degree of accuracy and any degree of accountability in their contribution to environmental/climate change.



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**Johannesburg's Rea Vaya Bus Rapid Transit: Perceptions and Reality**

Nicolaas Jacobus KOTZE (South Africa)

Most cities in the word are facing an increase in population density and in private car ownership. As a result public transport systems have become a burden. Therefore, the introduction of efficient transport systems to combat the higher population density has become a priority in the larger cities of the world, as well as in South Africa. Such a strategy has been adopted by the City of Johannesburg with the implementation of the Rea Vaya Bus Rapid Transit (BRT) system. Elements were taken from the BRT systems of Curitiba and Sao Paulo in Brazil to establish a world-class transport system for Johannesburg. The objectives of all Bus Rapid Transit systems are to reduce the travelling times for commuters, to ensure safe journeys and to deliver these objectives at a lower cost. An ongoing study conducted since 2014, has set out to ascertain whether these objectives have in fact been reached by the Rea Vaya Bus System in Johannesburg. The cost of trips was found to be competitive as opposed to the cost of other modes of transport in the city. The bus stops were also found to be well-designed and with effective paying points. However, although bus-only lanes were developed for the Rea Vaya System in Johannesburg, civil insubordination prevented the busses from running on time. As a result, they arrived either earlier or later than the stipulated times at bus stops, or not at all during periods of labour disputes. Furthermore, some of the passengers were of the opinion that the drivers tended to exceed the speed limits that they were inclined to drive dangerously, causing accidents.



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**Ecological rating of the post-Soviet countries capitals**

Natalia KOLDOBSKAYA (Russian Federation)

Application of integral indices and ratings on a small-scale study level due to the need to identify key environmental issues, structural changes and assessment of environmental transformations vector. As a result, consideration of a large number of research methods we have developed own, which can be considered as typical features of cities influence, such as pollution from stationary and mobile sources, structure and mechanism of pollution and its consequences, but also"unique"features.After the calculations 16 cities were divided into three categories: favorable ecological situation, satisfactory ecological situation and unfavorable ecological situation. At the top rating (ie, the most polluted cities) from 1988 to 2000, there were always 4 cities periodically slightly changing places: it Baku, Yerevan, Kiev, Minsk. But, as in 2005, and in 2012 the most polluted capital of post-Soviet countries - Alma-Ata.Favorable ecological situation for 20 years are characterized by the Baltic capitals. This is due to the closure of about 90% of industrial enterprises, as well as in connection with the introduction of new environmental standards for membership in the EU.There is a group of cities that for all time slices were at an intermediate position in the ranking slightly changing places. Basically, it is the capitals of the Central Asian countries and the Caucasus. Based on these ratings, the typology was developed capitals in terms of the current environmental situation and the direction of its transformation: it was revealed 6 groups of cities, and structural changes of the integral index.



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**Sustainable learning for cities: urban agriculture as a tool for special educational needs learning and teaching & community building**

Don MACKEEN (United Kingdom)

In the last decade urban agriculture has been proposed as a means of re-building communities, particularly in post-industrial cities such as Glasgow, Scotland and Detroit in the USA. In addition, new learning and teaching approaches, such as the Scottish Government's Curriculum for Excellence have promoted an holistic educational ethos that emphasises a student-centred learning experience within a context of active citizenship. This paper looks at a case study where urban agriculture was used as both a community building and a learning and teaching opportunity. The Townhead Village Hall project was a community garden created by students with Asperger syndrome for a Glasgow community in an area of multiple deprivation that lacked amenities. The project aimed to increase cooperation and understanding between students with special educational needs and a community that has been impacted by recent College building plans. The paper looks at the benefits to the students and the community, discusses lessons learned and makes recommendations. The paper argues that for the students and the wider community to benefit, issues of control and ownership must be embedded within the project design and further argues for a City Farm that can function as an educational hub with an emphasis on developing sustainable community growth.



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**The challenges and sustainability of urban farming in Nigerian cities**

*Yusuf SALEH, Aliyu Ja'afar ABUBAKAR (Nigeria)*

Farming activities in urban environment are been constraint with enormous challenges which are complex than conventional farming in rural areas. The aim of this study is to investigate some of these problems and examine the sustainability of urban farming in the study area. Farming has been an important activity in cities that presents both positive and negative impacts. The results revealed that a number of human and environmental problems affects farming activities. However, urban areas serve as a future growth centres to urban farming. KEY WORDS: Urban, Farmers, Problems, Future and Sustainability



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**The concept of landscape planning in urban environmental management**

*E.I. GOLUBEVA, T.O. KOROL, T.A. VOROBYOVA, S.V. KISELEVA, T.A. BARABOSHKINA, N.I. TULSKAYA (Russian Federation)*

Rapid increase in population size and density significantly affects natural, cultural, and historical urban environment and requires comprehensive study, including development of urban management mechanisms. Landscape planning and environmental safety are an important part of complex management of urban development, focused on minimization of environmental risks and promotion of ecological safety, comfort, health, preservation of cultural, and historical and spiritual heritage. It is based on effective territorial organization of urban space, optimization, and innovative "green technologies". It provides for environmental safety (evaluation of physical, chemical, biological, and aesthetic environmental, assessment and forecast of environmental risks), optimization of structure and functions of urban space (landscape and environmental planning in urban areas associated with functional changes, protection of natural and cultural heritage, development of ecological framework, design of new types of settlements), and use of "green technologies" in planning and development of functional urban areas at all scales (sustainable design, back to nature, low impact). We are currently developing a multi-scale geoinformation system (models for identification of interaction between nature, economy, and human components) based on a comprehensive multi-disciplinary (eco-geographical, environmental health, landscape planning, cultural, historical and aesthetic) study. The large-scale level (1:50 000-1:10000) is used for regional districts, individual settlements, and industrial zones. The local level (1:10000-1:2000) accommodates landscape-architectural study and design for various urban functional areas. The micro territorial level (1:2000 and larger) provides for new development projects and design of settlement centers, neighborhoods, industrial sites, parks, and rural settlements. The studies were conducted with the support of Russian Foundation for Basic Research (project 15-05-01788 A)



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**Sustainable green space planning strategy based on the GI theory in High-density Macau city, China**

*Li MIN, Xiao XI (China)*

Green infrastructure (GI) as a way of comprehensive spatial planning based on the conservation and management of land resources, against the spread of environmental, social and economic impact caused by urban phenomenon, provides strategic solution to ease the high-density urban land use, economic and ecological development, culture protection and urban expansion. This paper puts forward some guide for urban green space system planning of high density urban development through the review dynamic development of GI theory application in foreign cities, namely, to carry out forward-looking initiative project of sustainable planning, construct multi-functional and flexibly connected green space system and dispersed green space and use GI benefit assessment means to optimize related development policy. This paper takes Macau as a sample to construct a principle which is based on the GI theory and adapted to high-density cities. By using technical means and policy measures, we can do a lot to plan the city and change the cityscape such as marking the vacant lot and change them to green space, utilizing buildings making vertical planting , embedded greening, etc. We also take policy measures, using GI toolbox to estimate the economic value and guiding design, setting the policy for vacant lot changing, and organizing public involvement according to local conditions.



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**Multi-scalar assessment of vegetation cover change and green spaces in growing metropolitan areas of Chile**

*Francisco de la BARRERA, Cristian HENRIQUEZ (Chile)*

Urbanization is one of the causes of loss of peri-urban natural ecosystems, but also creates conditions for the development of sustainable solutions for urban and surrounding ecosystems. Vegetation contained in urban settings can contribute to solving some major urban problems: air pollution, heat islands and risks of floods, through the ecosystem services it provides. The aim of this work was to analyse the change in vegetation cover through the NDVI as indicator, and indicators of green spaces provision. As case study we chose three metropolitan areas of Chile climatically differentiated and under urban sprawl. First we analysed the mean NDVI in a period of 14 years, using daily measurement. Secondly we compared the vegetation index of two Landsat images in 1989 and 2009 in the urban core and peri-urban area. We also calculated several indicators to evaluate green spaces provision after map all green spaces. Finally, using RapidEye we identified hotspots of vegetation cover within the urban area and describe in its urban situation. All of them showed a decrease in vegetation cover, especially in the urban core. In contrast, in the area built-up in the last 20 years, the vegetation cover increased, as consequence of landscaping, irrigation and vegetation management. However, hotspots of urban vegetation were mostly concentrated in rich neighbourhoods able to finance such conservation and developments, especially in a context of water scarcity. Increasing the provision of services by increasing vegetation cover contributes to human well-being, but the sustainability of such vegetation management should be observed.



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**Ecological situation changes in the Moscow capital region over the past 25 years**

*Natalia KOLDOBSKAYA, Victoria BITYUKOVA (Russian Federation)*

Compression of economic activity to the capitals in recent years has meant that the load is shifted to the Moscow region, where the environmental situation is assessed as critical. Growing concentration of the population determines the highest levels of loading on water resources, waste volumes, and the impact of motor vehicles. In the Moscow capital region there is a growth of water consumption, and the main sources of pollution of surface water bodies are contaminated household, industrial and storm sewage of cities and towns and cottage settlements. There is a growing pressure on forests due to illegal logging. Trends in the ecological situation in the Moscow region for the past 25 years are ambiguous and complicated. When increasing the region's share in the production volumes of the country (38% in constant prices from 1991 to 2014) decreased its contribution not only to emissions from stationary sources, but also from vehicles. Moscow region provides 2.5% of Russia's emissions from stationary sources, 5% - from motor vehicles (and taking into account Moscow - 15%), taking on the total index of air emissions in ninth place. At the same time 1.5 times rose the share of the region in the pollution of water resources of the country, over the last ten years the area of solid waste landfills and illegal dumping increased 8 times, the forest area has decreased by 5%. In recent years, in the Moscow capital region have changed not only the proportions between different types of environmental impact, but also between urban areas and spaces between roadways. It was strengthened regional differences in the contribution of anthropogenic impacts. The maximum difference between the areas of emissions into the atmosphere in 2014 compared since 1990 have increased threefold. In the peripheral areas of the region amplified the impact of agriculture, in other areas exposed to an increasing proportion of human impacts of land as a result of the rapid development of suburban real estate market and the expansion Moscow territory.



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# Dynamics of Urbanization and Deteriorating Atmospheric Quality in Metropolitan Regions of India- A Case of Agra

Vishwa Raj SHARMA (India)

The exponential population growth together with rapid urbanization over the years has substantial impact on the environment of the city. The city is known for Taj Mahal, one of the Seven Wonders of the World which draws tourist from all over the world. Thus, there is a great pressure on the environment of the city. Rapid urbanization and unprecedented industrial and economic development during the last four decades have increased the pollution levels of Agra by many folds. Consequently harmful emissions such as lead (Pb), Sulphur dioxide (SO2), Oxides of nitrogen, Particulate matter and carbon monoxide etc. have also registered a sharp increase. National Environmental Engineering Research Institute (NEERI) has formulated the Air Quality Exposure Index to assess the combined impact of SPM, SO2 and Oxides of Nitrogen (NOx) concentration on the environment. Their combined effects have been the virtual transformation of the city of Taj into an island of smoke and dust. The industries in Agra generally belongs to the categories of leather products, food products, hosiery items, general engineering, metal processing and products, machinery parts, textile products including zari, jardosi, carpets, durries and marble work. The total number of SSI units in the city is 5,263 and the investment in these SSI units is Rs.263 crores. The total number of exporting SSI units is 131 and shoe export units are 87. The annual export from exporting SSI units and shoe export units is approximately Rs. 1500 crores and Rs. 1000 crores respectively. The annual export from SSI units also includes the indirect export. The sectoral distribution of investment shows that Rs. 89 crores and Rs. 50 crores are being invested in agro-based industries and service sector respectively. Central Pollution Control Board in collaboration with IIT Delhi and 15 other institute had formulated criteria for Comprehensive Environmental Pollution Index (CEPI) and identified prominent industrial clusters, based on their CEPI score. As per the report Agra is one of the Critically Polluted Industrial Clusters identified in the State of Uttar Pradesh. The CEPI score of Agra city for Water, Air and Land are 63.75, 59 and 59.5 respectively. Suspended Particulate Matter (SPM) is reported to be higher than permissible levels at Agra and they are a cause of concern. They contain red colour compounds of iron, which cause oxidation of SO2, NOX etc. to corresponding acids. These mineral acids even in small concentrations can be harmful to the material of monuments and also to the living beings. The air in the Agra city contains very high levels of sulphur and nitrogen oxides. The resulting acid rain reacts with marble ($CaCO_3$) of Taj Mahal ($CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$) causing pitting in this wonderful monument that has attracted people from around the world. As a result, the monument is being slowly eaten away and the marble is getting discoloured and lustureless. This paper attempts to assess the existing status of the urban environment of the Agra city.



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**Heavy Metals Pollution On Surface Water Sources In Kaduna Metropolis, Nigeria**

Yusuf SALEH, Aliyu Ja'afar ABUBAKAR, Kabiru SHEHU (Nigeria)

This study tries to examine the effects of heavy metal pollutants to aquatic ecosystems and the environment by considering the role of urban, municipal, agricultural, industrial and other anthropogenic processes as sources of heavy metal pollution in surface water sources of Kaduna metropolis. Samples of the polluted water were collected in River Kaduna and along the Kakuri – Makera drains in the month of February 25th and 29th, and on the 3rd of May 2009. The sampling sites were selected in view of the fact that urban, municipal and industrial discharges pass through the drain and empty into River Kaduna which drains most of the metropolitan area. The samples were taken to the laboratory where the X – Ray florescence (XRF) was used as an analytical technique for the detection of the heavy metal pollutants and their concentration in the samples. The results were compared with the World Health Organization (WHO 1997) recommended standards in order to ascertain the magnitude of pollution and the quality of the water. The concentration of most of the metals was observed to be higher than WHO acceptable limits. The results show that there is no significant relationship between the quality of water from the river and the recommended standards given by (W.H.O 1997). It is concluded that the water from the river is polluted and may cause serious ecological and health hazards. The research finally recommends among other things that there should be proper monitoring of effluents, into receiving water, portable water, as an integral part of water management in the rivers to enable verification of whether or not imposed standards and regulations are met. KEY WORDS: Heavy Metal, Pollutant, WHO, X – Ray florescence (XRF), Surface Water and Kaduna



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**Ciudad Juarez, Chihuahua, México, The Impact Of The Climate Change In Housing: Two Sustainabiliti Strategy S**

Elide STAINES (Mexico)

In Ciudad Juarez the challenges of the border are many, in a world with news describing its excesses, the geopolitical position is a must for the smuggling of drugs into the USA, which has worsened in the five years (2007-2011), causing considerable damage to the city in critic points such as , unemployment, high insecurity and an exodus of 250 000 people. For the Mexican population, the consumption of energy resources is a problem that's more accentuated for the classes with lower economic resources due the price climb that's been happening to electric energy and gas used for fuel; this problem is worse for localities in the north of Mexico. Because of this, it's necessary to propose technologies of primary and domestic use; with these elements we can regain the renewable resource most available in our region, solar energy. This proposal combines a eco technologies and a bioclimatic strategy to build houses and in this way for households to cope with climate change with sustainability strategy's . The eco technology is a wall and an integrated solar stove, to improve housing comfort and battle the high costs of fuels; the solar prototype aims to satisfy the social housing dueling family's pressing needs, where the spending in energy to cook or heat is very high; it's also an alternative to avoid carbon monoxide intoxication deaths, the accumulation of gas or firewood, that happens each winter in the city. The Proposed urban architecture of an ecological model to develop the design of urban buildings for social housing under the premise of saving energy for the regions of Mexico, across the ECOPLAN, a pioneer plan in growth areas KEY WORDS Bio architecture Energy saving Climate change Eco-Technology



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**The ecological rating of Russian cities and towns**

Victoria BITYUKOVA (Russian Federation)

The first ecological condition rating of all Russian cities and towns is based on the anthropogenic impact intensity integrated index calculation, including air pollution, water sources, solid waste, thermal and radiation pollution. The integral index of anthropogenic impact intensity was calculated for all 1100 cities of Russia. There is a comparative ecological analysis of the extent to which cities and towns determine the ecological situation in their regions. The main factors of anthropogenic impact change were identified for different population classes. In the article, there are elaborations of new methods for integral estimation of anthropogenic impact level in cities and towns based on indexes comparable for all territorial levels and calculated for real polluted areas in consideration with the scale and impact intensity. Integrated indicator of anthropogenic influence has a synergistic effect, reflecting the scale and change of the territorial structure of the entire complex effects to asymmetric distribution of the population. Russian cities differ greatly in terms of human impact, the structure of the integral index is very diverse, even within the same group. Results of the study highlight the factors that increase the contrast of human impact in the cities - the contamination and distribution of waste varying degrees of danger, and leveling factors - water, air, thermal effects, and the level of accomplishment. In contrast from regions, cities differentiation index scale of human impact is lower than in intensity.



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## Creating Sustainability through Corporate Social Responsibility in Garhwal Himalaya, Uttarakhand, India

Suresh Kumar BANDOONI, V.S. NEGI, Arun Kumar TRIPATI, Mirana DEVI (India)

At present time sustainable development is need for society as development and environment both are necessary to sustain the life over the surface of earth. Therefore, creating the sustainability is utmost necessary of the world. The Corporate Social Responsibility (CSR) can play a very important role to create and promote sustainable development in India. The SEWA-THDC (a unit of Tehri Hydro-Electric Development Corporation) is running a programme through Corporate Social Responsibility (CSR) in Naugura gad watershed in Tehri Garhwal (Garhwal Himalaya) in Uttarakhand, India. The aim of the programme is promote to sustainability. The programme is managed by Department of geography, Kirori Mal College University of Delhi, India. The work was started in 2010, and before to the start the programme an intensive need assessment base line survey was conducted by the student and teachers of University of Delhi. Need assessment is define as the process of measuring the extent and nature of the need of a particular target population and of the area, so that development can be take a proper manner. The experiences of about four years are good example of creating sustainability through corporate social responsibility. The Naugura gad watershed is situated Pratap Nagar block of Tehri Garhwal district. In this watershed extreme and harsh condition social. Economic and ecological conditions are prevailed and villagers struggle for their livelihood and sustainability. At present time the villagers see social corporate responsibility as a best way to sustain the environment and livelihood.



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**The challenge of 'runaway cities' and search for sustainability across city scales in Kampala, Africa**

Shuaib LWASA (Uganda)

The fast-paced urbanisation, problems of pollution, land degradation and climate change impacts have put the lives of urban populations especially the urban poor at high risk. Facing the reality of dealing with the effects of climate change, the political, social and economic structures of urban development are grappled with finding practical solutions to the local challenges while addressing the long-standing sustainability development challenge. There are currently few comprehensive sustainable development city strategies. Where these examples exist, they often contradict the existing urban development structures. One of the requirement for sustainable urban development is a transformation of cities in Africa perhaps leapfrog of cities form developed regions. But there are contradictions on pathways and strategies for this leapfrog as cities innovate at multiple scales to create sustainable urban spaces. This paper will attest to the sustainable development strategies at multiple scales focusing on Kampala and highlight the limitations and contradictions created by political and institutional systems. Whereas the global agenda for sustainable development goals seems to be promising on the political side, the practical side of implementing the strategies are at crossroads. This feature is mapped and characterized with other cities in sub Saharan Africa.



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**Urban Environmental Challenges Of India: A Case Study Of Delhi**

Monica AHLAWAT (India)

ABSTRACT: In India major city faces the same proliferating problems of urban expansion, inadequate housing, poor transportation system, poor sewerage, erratic electric supply, insufficient water supplies etc. In metro cities like Delhi, land environment is under stress due to the pressure of rapid urbanization. Population growth and in-migration of poor people, industrial growth, inefficient and inadequate traffic corridors, poor environmental infrastructure, etc. are the main factors that have deteriorated the overall quality of the city environment. The level of pollution i.e. air, water and land has increased because of lack of poor environmental management. This has its direct impact on quality of urban environment. The lack of services such as water supply, sanitation, drainage of storm water, treatment and disposal of waste water, management of solid and hazardous wastes, supply of safe food, water and housing are all unable to keep pace with urban growth. Delhi is mini India with the largest number of immigrant communities who have made it their home. With rapid urbanisation, the rural area is shrinking; it has reduced, but urban population kept on increasing. The rapid urbanisation has led to the development of new settlements colonies in Delhi. In India increasing level of solid waste generation and its management is nowadays a serious problem in the urban areas. In recent times the growth of Delhi is characterized by increase in residential complexes, use of vehicles and rapid industrialization. The deficiencies in both planning and environmental regulations have led to the both health and environmental damages. The river Yamuna covers a 22 km stretch between Wazirabad and Okhla barrage in Delhi which is only 2% of its catchments area, but Delhi contributes about 80% of the river's total pollution load. Noise pollution in urban areas is another major cause of concern especially when there is fast increase in number of automobiles. Therefore, there is need for the use of urban information database that can be generated using remote sensing data and GIS techniques. Top priority should be given to the issues related to the planed development of the city, reduction in atmospheric pollution and traffic congestion etc. The problems and challenges faced by mankind are of national level but it has to be dealt at the local level.



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**Development, Displacement and Sustainability Among the Tribes: A Study of Sardar Sarovar Project in India**

Dalal SUSHIL (India)

Development, Displacement and Sustainability among the Tribes: A Study of Sardar Sarovar Project in India Sushil, Pt. N.R.S. Govt. College, Rohtak (Haryana, India) sushil_dalal@yahoo.com Abstract Development is essential for economic growth of the region and the construction of big dams is one of them. However, the construction of big dams is resulted into displacement of human population and has long term social, political, demographic, economic and environmental repercussions. These are manifold and complicated which accentuate severe pressure on already existing settlements at resettlement areas. The displaced population tries to interact with nature, land and the living entity of surrounding environment for livelihood. The present paper attempts to elaborate methods and materials used for survival system adopted by the resettled populace to investigate interrelationship among environment, society and economy at local level due to the construction of Sardar Sarovar Project. Results show that people have partially adopted social and economic adaptability while the relation with environment and ecology has been loosened in the process of resettlement. Key Words: Displacement; Environment; Resettlement; Survival System; Sustainability



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# Research on Behavior and Influential Factors of Household Intergenerational Cohabitation / Separation Residency of Chinese Urban Citizens :A Case Study in Chengdu

Mei mei WANG, Yong chun YANG (China (Beijing))

Miniaturization trend in chinese families is obvious since the reforming and opening up, the core cause is intergenerational separation residency,It poses a great influence on family harmony, social stability, and even housing market in the transition period of China. And there is a fundamental difference between the behavior and mechanism of intergenerational separation residency in Chinese and Western society. Therefore, conceptual model of household intergenerational cohabitation / separation residency of Chinese urban citizens ,based on ratio of separation residency and family life cycle,is discussed. In view of its rapid economy growing, obvious registered residents aging and double effect of Chinese traditional culture and Western culture values, the main zone of Chengdu city is selected for empirical study. Be different from the rule -- cohabitation residency to separation residency --of household residency in Western countries, which in Chinese urban families shows that: cohabitation residency –(a lesser extent)separation residency –cohabitation residency–separation residency–(a lesser extent)cohabitation residency–(a lesser extent)separation residency –(a lesser extent)cohabitation residency. Based on field survey data, main influence factors are selected via Pearson correlation analysis, and sig.value and impact direction of which are discussed by binary logistic regression. Conclusion follows:①Age, educational level, spouses living, household incomes per capita, household living area, (parent)help raising grandchildren, parents and their children should live near, aspiration of separation residency, eating habits, preferences on quietness or jollification, habits of parental care and private space have very significant influence on household intergenerational cohabitation / separation residency in Chengdu.②Educational level, spouses living, household incomes per capita, (parent)help( children) get married, (parent)help( children) buy a house, aspiration of separation residency, routine, eating habits, preferences on quietness or jollification, health habits and private space are positively related to ratio of separation residency;③Age, current / previous profession, household living area, (parent)help raising grandchildren, (children) have a duty to support the old, parents and their children should live near, having children in order to support the old, habits of occupying the home and habits of parental care are negatively related to ratio of separation residency.



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**Elderly Women In Indian Families: Verge Of Discrimination**

Yatish KUMAR (India)

The study brings to light the negligence of the female elderly in terms of social, economic and health aspects of life. Elderly women in Indian families suffer from poverty, isolation and social exclusion. In particular, elderly widowed women are often denied even basic rights such as food, health-care and are thrown out of their homes by their families. The death of a women's husband marks her transition from a wife to widow. In the Hindu society an elderly widow is physically alive but socially dead. The condition of elderly women in India is even more precarious and their conditions more vulnerable as compared to that of their male counterparts because of low literacy rate, limited social exposure due to traditional socio-cultural set-up, financial dependence owing to customary ownership of property. Consequently, elderly women in India are 'doubly vulnerable', firstly because they are old and secondly because they are women. The status of elderly widows varies from to region to region and from community to community. Hence, the focus of the study is to highlight on the condition of elderly widow in Indian society. Key Words: widowed, elderly, poverty, isolation.



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**From Relative To Absolute Declining: The Case Of Trieste**

Gianfranco BATTISTI (Italy)

Located at the northeastern edge of the Adriatic, Trieste is a port city now ranked among the top Italian maritime facilities. During the 18th and the 19th centuries it had developed to become the maritime terminal of the Habsburg Monarchy and as such it reached the third position in the south European ranking. The local economy flourished to such an extent that as for capitalisation at the beginning of the 20th century the Trieste exchange surpassed that of Vienna. Two world wars changed dramatically the geopolitical frame, progressively drying up the sources of the city's wealth. As a consequence, the demographic trend suffered an immediate rebound. What was once called "the most American among Europe's cities" for the uninterrupted flows of immigrants, characterised by the variety of nationalities, registered an abrupt stopping. During the Great War it lost a large part of its population; the postwar recovery was slow, complicated by important transfers of population following the disintegration of the empire. Politically separated from its hinterland, after the II WW Trieste had to experience also the loss of its historical umland. The debate concerning the city-country relationship was central during the years 1945-1954, when it was subjected to an international military government, its possess being politically disputed between Italy and the former Yugoslavia. The population decline, begun in the late 30s, was reversed by the exodus of the Italians expelled from the eastern shores of the Adriatic. New workplaces in the industrial sector were created for them by the Italian government, but a revival of the expansion cycle ended in 1914 was prevented by the developement of the nearby regions of Friuli and Slovenia. Therefore the labour supply definitely reversed its course, paving the way to population aging and its numerical reduction. As a consequence, the shrinking economic base underwent a series of transformations that reflected in the urban landscape. Owing also to the present economic crisis the internal demand is falling. This led to the closure of dozens of shops and restaurants whose owners are often replaced by Chinese immigrants. The reduction affects also the facilities for public services and cultural institutions. This is for instance the case for public hospitals, now adjusting to a shrinking population and therefore undergoing a loss of beds. In parallel with the exhaustion of land suitable for industrial activities, there is now a growing number of vacant buildings, which sinks real estate values. Finally, of key relevance is the problem of how to reuse the obsolete port facilities. The paper highlights the origins and the dynamics of current geographical changes.



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**Challenges Faced By the Elderly: A Case Study of Kolkata, India**

Anuradha BANERJEE, Chandreyi BANERJEE (India)

The district of Kolkata comprising much of the city of Kolkata has been an important industrial centre and seat of development since colonial times. Colonial legacy divides the district into two distinct spatio-cultural zones---the North with a traditional flair and the much modern South developed after independence from colonial rule. The district registered a negative population growth rate in the last census of 2011. As against this, compared to other districts of the state of West Bengal of which Kolkata is the capital, the district accounted for the highest proportion of 'aged' (60 years and above) population. This figure was even higher than the national average. Within the aged population again, the proportion of females was comparatively higher than males; feminisation of ageing being a pan-global phenomenon. In a completely urbanised set-up, this study therefore, attempts to bring forth the living arrangement and other related issues of old people particularly women across various social groups in the two different zones of the district, each zone presenting different pattern in this context. This is in wake of the increasing disintegration of the joint family system currently experienced by most Indian cities owing to dearth of space, increasing urban rent and job-oriented migration of the younger generations leaving the elderly people to great insecurity.



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**Demographic Transition and Population Aging in South India: Implication and Challenges**

Yatish KUMAR (India)

This paper will first study trends of fertility and mortality in southern parts of the nation and its consequences to changes in age structure, dependency ratio, health status, living arrangement and feminisation of the elderly population. Secondly, the paper will talk about challenges and opportunities brought about by the demographic transition and will conclude with some policy analysis. Population ageing is an obvious consequence of the process of demographic transition. The combination of high fertility and falling mortality during 20th century has ensured large and rapid increases in the elderly populations as successively larger cohorts enter the span of old age. Demographic transition is one of the most influential ideas of the twentieth century. The south Indian states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, where 20.7 per cent of 251 million of India's estimates total population of 1.21 billion (Census of India, 2011). The elderly population in India rose from 5.63 percent in 1961 to 8.58 in 2011. According to Census of India, 2011 the share of elderly population to total population in southern states was Andhra Pradesh (9.79), Karnataka (9.48), Kerala (12.55) and Tamil Nadu (10.41). Finally, findings of the study suggest that the existing programmes for the welfare of the elderly mostly focus on three important aspects like, social security, economic security and health status as well as health care utilisation among the elderly population in southern part of the country. Key Wards: Demographic Transition, Ageing, social security, Fertility, feminization.



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**Spatial Variety Of Social-Demographical Safety In The Countries Of Eastern Asia And Russia**

Tatiana KOMAROVA (Russian Federation)

Eastern Asia is one of the most dynamically developing region of the world. But in recent years negative demographic tendencies are distinctly traced: birth rate reduction, aging which complicate the solution of economic, social, geopolitical and other problems and therefore create threats for national security as a whole. Crude birth rate, crude death rate, infant mortality rate, percentage of people less 15 and percentage of people more 65 years old, life expectancy are used for calculation of an integrated indicator of social and demographic safety (IISDS). By applying the interval analysis we classify its changes under 4 types: social crisis – (less than 0,3), social tension – (0,31-0,5), social stability- (0,51-0,7), social wellbeing - (0,71 -1). Analysis of the results shows that the social and demographic situation can be characterized as transitional from social tension to social stability. We propose to divide countries into two groups: 1. The countries with social and demographic intensity: a. Japan, Taiwan – with slow decrease of IISDS; b. Russia – stabilization and slow IISDS growth; 2. The countries with social and demographic stability: a. China, South Korea, Mongolia – rather stable IISDS b. North Korea – relative instability IISDS. Low crude birth rate and a high percentage of the people over 65 years old are negative factors. Different reasons lead to these negative factors.



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**Population dynamics and commuters in districts headed by small towns in Central Russia**

Maria GUNKO (Russian Federation)

In 2010 in Russia 71% of urban settlements had population size less than 50000. Small towns concentrate more than 10% of the country's population. Despite the fact that 1/3 of the small towns in Central Russia lost population in 1970-2010, they remain relatively stable foci in the territory due to the much greater loss of population in the surrounding rural areas that lost 40 to 60% of the population over 40 years. With the reduction of employment in rural settlements, and the migration outflow of the young population from small towns, small towns and rural areas are closely linked by labor commuting. The study of 6 districts in Central Russia in 2012–2014 where about 2800 people were interviewed in terms of their employment showed that about 35% of interviewed rural population was engaged in pendulum labor migrations to small towns in districts headed by a town with a population 20000–50000 people and 25% - in districts headed by towns with population up to 20 000 people. The maximum number of commuters lived in the closest to the district's center villages, their number also depended on the state of transport infrastructure. Commuters from small towns working in rural areas are represented poorly – 5-10% of interviewed population of small towns, mainly in districts with non-agricultural employment in rural areas. But if migration outflow and aging of the population in small towns and rural areas continues at the same rate the number of commuters will largely reduce in the next few decades.



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**Rethinking Pregnant Mainland Women and the Cultural Politics of Birthright Citizenship: Towards a Feminist Geopolitics**

Tsung Yi HUANG (Taiwan (China))

Guided by feminist geopolitical scholarship that aims to problematizing dominant narratives of geopolitics by situating knowledge and looking at security on multiple scales, this project focuses on pregnant mainland women in Hong Kong and rethinks geopolitical concepts such as security, borders and citizenship. To bring to the fore the ways discursive technologies shape new cross-border political subjects and redefine security and citizenship, this project will first critically assess the rising narrative of the dominant images of mainland pregnant women as consumers of birth tourism and predators of resources to show the racialized and gendered language, which excludes mainlanders as the accidental other. Then I will move to highlight the stories of the mainland spouses of Hong Kong residents. Here the cultural texts for analysis include two recent films North Point (2011) and True Women for Sale (2008), both of which tell the stories of underclass Mainland pregnant women in Hong Kong. The visual representations will also be juxtaposed with a collection of interviews of spouses of Hong Kong residents, It is Her, but it is also You and Me: Interviews of Women with Two-ways Permit (2008). I will closely examine the device of the narratives to suggest how these alternative stories of pregnant mainland women negotiate the meanings of motherhood, family, ethnic identity and the Sino-Hong Kong relationship with prevalent geopolitical discourses and the symbolic and institutional boundaries they embody.



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**Green Mobility As The New Glurbanization Branding And Cosmopolitan Icon: The Case Of Taipei U-Bike**

I-CHIH LAN, WEN-I LIN (Taiwan (China))

When world major cities are planning the greening mobility through urban cycling, Taipei has been without exception as City Government initiated "Taipei Bike Sharing Pilot Program" as the greening mobility project called 'U-Bike' in 2008. After its formal operation in 2012, U-Bike system has been renowned for its prestige of environment-friendly images for lower carbon, pollution, and energy. However, the paper indicates that the project is a schematic glurbanization branding under neoliberalism. Due to the geopolitical barrier within Taiwan's interscalar tensions, Taipei lacks the matured climate for financial centre and TNC headquarters that general global cities endow. Instead, it relies on the complementary imagineering of new urban space to fix mobile capital. The place-remaking not only requires physical renewal but also repackages sustainable narratives to target new markets and create new customer segments. Progressive ideas adopted by advanced cities are also imitated as the common global norm for the catching-up urban latecomer. Through analyzing the interscalar tensions of Taiwan, greening discourses of U-Bike, and the neoliberalization of urban regeneration in Taipei, the paper argues that U-Bike system is in essence a glurbanization branding to overcome Taiwan's ambiguous neoliberal climate and create a shortcut for Taipei's visibility to detour the geopolitical barrier. It also functions as the cosmopolitan icon for City Government to reimage the built environment meeting the international standard of livability and intimating advanced global norms.



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**Successful Cities – From Marketing And Image To Branding**

Martina HEKLER (Austria)

City marketing has become a widely accepted strategy to strengthen urban development. But, at the same time, the differences between leading global cities are diminishing. The cities compete with each other within the same market, for the same or similar target groups. Therefore, the cities that want to succeed must position themselves well on the global market by developing unique identities that are original and unique. In this competitive environment, city marketing has become an increasingly popular practice all over the world. It has quickly developed as a strategy in response to the new economic, political, social, and cultural changes taking place in urban areas across the world. Some cities have proved themselves to be more successful in branding themselves than others. They market their history, their cultural heritage, their unique lifestyle and their image. They intentionally make use of all these factors in order to create a strong brand. What are the strategies of successful cities that help them to be a strong brand with specific, clearly identifiable identity? A city that has proven to be outstandingly successful in branding is the city of Vienna in Austria, Europe. The city of Vienna therefore is taken as a case study, to analyze the key issues how a city can market itself successfully. What are the prerequisites and main "ingredients" of an effective city marketing strategy? This session aims to explore the field of city marketing and to identify the strategies that cities pursue to establish their unique brands. One of the basic postulates of city marketing is that city brand develops out of a strong city image: A powerful image has a potential to turn gradually into a brand. However, the positive preconceptions about the city existing in the minds of its consumers are not enough to build a strong brand identity. There is a need for a consistent marketing strategy that fills the city's unique selling propositions with meaning and life. Vienna provides an illustrative example of a city that has adopted a systematic and professional approach to city marketing and city branding. The presentation will focus on the lessons learned through the branding process, and identify key issues that need to be addressed by other cities if they also consider to manifest themselves as a new brand in the market. Aspects of perspectives and limitations of branding will be discussed in principle. An outlook over the future perspectives of branding will be given.



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**Football Stadiums In Guadalajara, Jalisco: From Identity's Exploitation To The Spatial Urban Production**

Dante Guillermo Celis GALINDO, Jonathan Montero OROPEZA (Mexico)

Guadalajara, Jalisco, is characterized for being one of the most important cities in Mexico, as well as being the source of the main nationalist stereotypes promoted by the State. In sports matter, this city is equally important, because it has the soccer team with more fans in the country: the Guadalajara Club. Around that sports team, two stadiums were built in different historical and economic circumstances, additionally they are targeted to opposite social sectors. The first one, the Jalisco Stadium, opened in 1969, was built near Guadalajara's center, with the aim of being a consuming space for popular social sectors, which mainly reside in the western sector of the city. By shaping the Guadalajara Club its golden past in that stadium, people took affection to it and considered it as a city´s geosymbol. That stadium had been the home of major sporting events that took place in the city and even in the country, like the soccer world cups of 1979 and 1986. The new Omnilife Stadium, opened in 2010, is located in Zapopan, a town that was important for the production of corn which, by modifying the Guadalajara´s borders, became one of the most exclusive and added value zones in the country. This property is the starting point of an urban megaproject sponsored by the Guadalajara Club's owner, Jorge Vergara, character benefited by the neoliberal policies promoted by the Mexican State. The stadium still has not become an urban reference as a result of its complicated accessibility and the high price of ticketing, even when it counts on the government's support.



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**A City And Its River: The Reproduction Of Post-Industrial Chicago's Urban Political Ecology**

Garrett WOLF (USA)

The Chicago River was once the industrial heart of Chicago. Today industry has moved to the suburbs or overseas, and the Chicago River is now in its post-industrial era. Throughout most of the Chicago River's history, it has been produced and reproduced by the traditional major actors that influence urban networks: large corporations and city government. The post-industrial Chicago River has transitioned to a visual and increasingly recreational amenity and away from an industrially dominated river. This transition has resulted in decreased involvement of large corporations and shifting regulatory responsibility of city government, which has not always kept pace with the usage realities of the Chicago River. In the void created by this transition, citizens and other intermediary groups, often seen as less influential both in real terms and in Actor Network Theory, have emerged to influence how the post-industrial Chicago River is produced. The major priorities of citizens and other intermediaries, such as NGOs, non-regulatory government agencies and small businesses, are not necessarily aligned. As environmentalism and the desire to use the river for recreation have become motivating factors, intermediaries have found allies working in similar directions. These intermediaries have pursued varying goals as proponents of the river as a visual or recreational amenity to similar ends. This research looks at how shifting post-industrial roles have given these intermediaries more power to exert on the production of the urban environment and have helped chart a new course for a post-industrial Chicago River.



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**Contradictions in a complex urban space of a Brazilian small-sized city. The city of Cachoeira between the program of historical tourism and the installation of an university campus**

Wendel BAUMGARTNER (Brazil)

We bring an analysis about the results of two development projects applied in the urban space of Cachoeira, a small-sized city in Brazil, with 20,000 inhabitants and located in Bahia State (Northwest Region). Cachoeira played an important role for almost 300 years as a commercial trade place and plantation area of sugar cane and tobacco. All this wealthy economy was ruined during 1950's when the transport changed to a road based system, where no major roads are connected with Cachoeira, which become separated from the new transport system. All the factories, warehouses and trade centers had closed and part of its population was obliged to migrate to other cities. To overcome this economic stagnation, which persisted for some decades, several actions related to the urban and regional planning and economic development have been implemented in Cachoeira since 2005, amongst them the Monumenta and the University Campus. The Monumenta Program (Ministry of Culture) is a restoration/conservation project of important historical buildings trying to promote the historical tourism. The campus is a branch of the public and new Federal University of Recôncavo da Bahia – UFRB (Ministry of Education). The set of actions implemented in this location carry some contradictory forces, connected with different approaches, while one intend to conserve the spaces of the city (forms) for an incipient historical tourism, the other one intend to develop a more permanent economic force and to promote an economical functions growth. The development of our paper will bring the results of two public policies in the urban space of Cachoeira and it is supported by the theory of the production of space (Henri Lefebvre).



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**Urbanisation in Asia in the 21st Century: Issues and Challenges**

Twisha SINGH (India)

Asia has a long history of urbanisation with some of the earliest urban hearths being located in India and China. However, the 21st Century has ushered in rapid and unprecedented urbanisation in Asia particularly for large countries like China, India, Pakistan, Bangladesh and Indonesia. Such unprecedented urbanisation has thrown up several issues and challenges in terms migrant population, informalisation/casualisation of labour force; slums and squatters; pressure on urban infrastructure, amenities and facilities; as well as city management in the next couple of years. However, in spite of these ills, Asian Urbanisation has also brought along positive impacts, like rising investments through MNCs in expansion of infrastructure and urban services, decline in urban poverty and rising living standards in many of the cities. The study has been based on several secondary sources of data from the Asian Development Bank, United Nations, World Bank, Human Development Reports, World Development Reports, National Censuses, Population Reference Bureau (US) and other documentary sources. The salient findings of the paper indicate that though rapid urbanisation has resulted in great population pressure in the Asian cities and deterioration of urban environment particularly in the congested areas; but at the same time there have been improvements in services, amenities and facilities in many of the Asia's largest cities. However, there are significant regional differences across the Asian countries in terms of urban development which calls for strengthening the management of cities and local urban governance in many places.



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# DICHOTOMY OF URBANISATION AND URBANISM: THE CASE OF HAFLONG AND KOKRAJHAR TOWNS OF ASSAM, INDIA

Bimal KAR, Rakesh CHETRY (India)

An urban centre mirrors development of an area and acts as the hearth of diffusion and assimilation of a variety of socio-economic elements. Study on urbanism in some Indian cities indicates remarkable changes in the traditional way of life in the form of a complex culture with combination of both rural and urban character. Urbanism encourages higher living standards, struggle for sustenance, inclination towards more secular and free thinking breaking away from the typical religio-ritualistic bindings, and adoption of a new group identity based on economic and social advantages. However, the idea of urbanism is far more complicated in the case of a poorly urbanised state like Assam in India. Here, the rural-urban distinction has never been very sharp; both for land-use and human characteristics like psychological behavior, customs, traditions, etc. In this perspective the present paper intends to understand the way of life of the urban dwellers in terms of change in family structure including family ties, religious belief and women status of Haflong and Kokrajhar towns of Assam. The study is primarily based on the analysis of field data collected through sample household survey of both the towns. It reveals that although both the urban centres are experiencing rapid urbanization in terms of area and population, the influence of customs, traditions, rituals, languages, land-use, social-groupings, family background, food-habits and other ways of social behaviour of rural areas upon these towns still persists. Forces of religion have not contracted yet, where still inter-caste, inter-community and inter-religion marriages are restricted.



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**Waste management and recycling: issues faced by the City of Johannesburg**

Dorothea SCHOEMAN, Jabulile GALELA (South Africa)

Population increases in urban areas, improved living standards and lifestyles, rising incomes and the purchase of temporarily useful products have led to increasing amounts of waste being generated in city environments. As a result, municipalities are struggling to effectively manage waste in urban areas. This inefficient management of waste can be attributed to the lack of working tools, financial constraints, a lack of skilled workers, inadequate infrastructure, and limited public knowledge and participation. Increasing amounts of waste are deposited on landfill sites annually, obstructing development and limiting living space in cities. The City of Johannesburg is running out of landfill space, with an estimated 9.5 years of landfill space left. Therefore, there is a need to study, understand and explore waste management, particularly recycling, within local municipalities. This study identified challenges facing the City of Johannesburg municipality in respect of waste management and recycling. Some of the issues identified include lack of experience in waste management, financial constraints and the lack of public participation in recycling initiatives. Solutions proposed by municipal employees are the integration of informal waste pickers and that the scope of public awareness be increased to improve recycling initiatives and to divert waste from landfill disposal sites.



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**Urban and Human space in Kinshasa**

Fabiana D'ASCENZO (Italy)

This paper aims at a geographical reading of Kinshasa, present capital of the Democratic Republic of Congo and second largest city by population in sub-Saharan Africa. Its main endeavours are to unveil the basic elements which structure the urban territory and throw light on the relations of those living in the city with it. The form and evolution of the city are analysed and focused in progressive staged, thus placing Kinshasa within broader space and time frames. Thus it was necessary to broaden the scope of the research to both national and interafrican context, considering both historical and present times to understand the relations of the capital city, whether existing or missing, with that context. The analysis of urban development in Kinshasa moves from looking at the past to the present day will attempt to show that the colonial dualist structuring of the urban space represents even today an active legacy which has an effect on the way the entire capital functions. In fact, within its confines, the capital is channeled entirely towards the centre-ville and the poor level of interurban exchanges between the various districts highlight a spatial fabric with scarce communications. The privileged relationships are concentrated around few areas so, since it is impossible to share and circulate resources, citizens' needs have forcefully led to the creation of numerous stratified or interwoven strategies (irregular urban settlements, informal economy and practices of the sous-informel, small businesses, urban vegetable plots and other forms of living on the fringes).



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**The (Re)production of Housing Space and Housing Policies: from Institutional Perspectives**

Yeon-Taek RYU (Republic of Korea)

This research investigates (1) geographical disparities in the changes in house prices and rent levels at spatial multi-scales (national, inter-urban, and intra-urban), (2) impact of financial crisis on Korean housing markets across geographical multi-scales, (3) roles of housing agents in the (re)production of housing space in the Korean context and their interrelationships, and (4) social and political construction of geographical scale in conjunction with Korean housing politics. The contrasting spatial variations in the degree of vulnerability to the financial crisis differently redistributed real estate wealth at spatial multi-scales. The Theil index analysis demonstrates that the degree of spatial inequalities in house prices and rent levels not only across Korean cities but also within Seoul has increased during the last two decades, and was reinforced by the financial crisis. This research conceptualizes how social actors operate across spatial scales by utilizing institutional networks, and how geographical scales have been politically constructed by contentious housing agents in order to gain more control over the (re)production of housing space at spatial multi-scales in the Korean context. Under a regulatory regime, the Korean central government gained more control over the production of housing space at geographical multi-scales by means of 'jumping scales.' The Korean central government has increasingly obtained the capacity to 'jump scales' by using not only multiscalar strategies for housing developments, but also taking advantage of various forms of institutional networking among the central and local governments, quasi-governmental institutions, and Korean mutinational corporations (Chaebol), across the state.



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**Social ecology of immigrant population and changing urban landscape of Thimphu, Bhutan**

Raghubir CHAND (India)

Thimphu, the capital of Bhutan till the 1950's was a cauldron of terraced rice fields sprinkled with few houses and nucleated settlement around the Dzong. Thimphu evolved as the first city of Bhutan after the establishment of the capital in 1955. It was only after the construction (1961- 1969) of Tashichoedzong (the capital seat of the King), the focus turned towards town development. In recent years, the capital has witnessed high growth rate of population averaging 30% per annum. The population of Thimphu in 2000 was 43,479 which increased to 98,676 as per the first census of Bhutan conducted in 2005. This study addresses social-ecological dynamics in the capital City of Thimphu of Bhutan with focus on the immigrant population. Like other developing countries, Bhutan is also experiencing rapid urban expansion mainly due to immigration from rural to urban areas. Internal migration has lead to major socio economic and demographic changes in the Bhutanese cities. This paper is based on the sample survey of 244 immigrant households of Thimphu town surveyed in 2010 . The analysis is carried to study the variables like family status, sex composition, age, occupation and educational characteristics. The living conditions of sample households and their attachment with the place of origin with frequency of visits along with the year of migration and reasons for migration are also captured to interpret the changing urban landscape and social ecology of Thimphu. The results thus acquired are likely to be used for the future planning of the capital city of Bhutan.



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**The State of Cities in Northwestern India: Emerging Issues and Options (Some evidence from recent studies of Three Metropolis)**

Manoj Kumar TEOTIA, Rajender KUMAR (India)

The state of cities in North-western India in the context of housing, infrastructure, basic services, poverty and environment etc is poor due to absence of strong local policies and institutional, legal, functional and fiscal inadequacies. The situation is worst in three metropolitan cities of Srinagar (Jammu & Kashmir), Amritsar (Punjab) and Faridabad (Haryana). Cities are rapidly urbanising with faster growth of slums and housing, basic services and livelihood for the poor are grossly inadequate. The recent studies by the authors are indicative of crucial urban issues and challenges which have been acquiring serious dimension in the wake of rapid urbanization. The planning violations are rampant and slum rehabilitation programmes are ineffective. The absence of strong local governance and development policies, absence of system of devolution to the third tier of governance, poor rate and base of taxes, absence of house tax/ property tax and user charges from water supply and sewerage etc, prevalent culture of freebies, growing non plan expenditure, lack of implementation of reforms under central initiative of JNNURM are some of the factors responsible poor state of local affairs. This has been affecting social and environmental fabric of all three cities. In the context of above, paper tries to highlight certain similarities and differences among the selected metropolitan cities in the context of urban governance, development, planning, infrastructure, basic services, poverty alleviation, disaster management and environment etc to explore emerging issues and options.



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**Facilitating generation of local knowledge using a collaborative initiator: A NIMBY case in Guangzhou, China**

Yi SUN (China)

This study claims that the synergic effects of collaborative governance and effective knowledge integration can solve the wicked policy issues. The function of collaborative initiators (CIs) is studied and defined. The mindset of leaders and entrepreneurs as CIs is generally different from that of public managers. Such mindset helps facilitate collaborative dynamics integrating otherwise distributed capacities and knowledge within policy networks. This study examines a case with reference to the site selection of a waste incineration power plant in Guangzhou, China. A unilateral process emerges among the residents of the district to accumulate the self-qualified knowledge before a general discussion was put forward. "Explicit knowledge" intensifies the hostile situation between the public and officials although such knowledge can be easily accessed through an Internet search. A general discussion reveals the potential for generating local knowledge conducive to abolishing the not-in-my-backyard mentality and prompting collaborative problem solving. District government officials are potential CIs whose roles remain in their infancy. This study finds that a collaborative initiator lacks entrepreneurship when faced with an influx of public opinions. The Chinese CIs vacillate between a rule-dominated manager and a policy entrepreneur with the evolution of China into a more diversified society.



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# The Impact of Institutional Path Dependencies and Lock-ins on Urban Spatial Restructuring in China

Yongchun YANG, Qingmin MENG (China)

The spatio-temporal pattern of gradual institutional transformation embedded in China's political-economic institutions since 1978 has formed a model of "administrative urbanization" that has changed the role that the local state plays in city-making and changed the mechanisms and processes of urban change. Correspondingly, this has also driven the restructuring progress of urbanization in China, which can be called Chinese-style urban spatial restructure (USR). The USR needs to be understood within a comprehensive historical context. Throughout China, USR is an institutional progressive system that is currently being formed under a myriad of complicated driving forces, such as less Foreign Direct Investment (FDI) and more SOEs-SCs-NWUs referring to state-owned enterprises, shareholding cooperatives dominated by government, and non-produced work-units in inland. Therefore, USR need to be clearly identified and analyzed in order to understand the spatial-temporal urbanization in China. This paper makes two arguments. First, even in light of recent trends towards strong local authority, USR is still dominated by the central government party. This suggests that USR fosters the continuous economic growth through old city redevelopment, the creation of development zones etc. Secondly, we developed a model that identifies the path-dependency of SOEs-SCs-NWUs' location and relocation, state's institutional reform, and actor (re)locating-led lock-ins and regionally gradient lock-ins from the process of USR for Lanzhou, China, which is one of the largest inland cities in the country. Previous research has only applied USR models to analysing coastal cities. This study provides a key step in understanding the role of local and central government agencies in the restructuring of China's large inland cities.



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**The post-socialist liberalization of planning system and its impact on urban development. The case of Poznan city-region**

Tomasz KACZMAREK, Łukasz MIKUŁA (Poland)

Since 1990s large urban areas in the Central and Eastern Europe have been undergoing a very dynamic functional and spatial transformation. This process is much diversified among countries and within them (eg Hamilton et al, 2005 Stanilov et all 2007). The adaptation of urban areas to the new political, social and economic conditions has usually not taken place in a planned and coordinated way. In the face of the liberalized spatial planning system, most of the new investments in urban areas of CEE were subordinated to the interests of individual actors rather than comprehensively managed spatial development processes. It definitely brought some economic benefits, but the problems concerning transformation of 'greenfield' areas into residential districts turned out to be a serious burden for municipalities. The aim of this paper is to present the problems of uncontrolled spatial development in post-socialist countries, basing on the example of Poznan city-region, in the west of Poland with the population of ca. 1 million people. The spatial structure of this area has been much changed for last 20 years due to the intense process of suburbanization. The main findings from the paper indicate the effects of the deregulated spatial planning system which favors 'greenfield' development over regeneration of inner cities and 'brownfield' sites and generates inequality between public and private actors with much stronger position of the latter.



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**Renovation of post-Soviet neighbourhoods of blocks of flats: the demands and attitudes of residents (case study of Žirmūnai neighbourhood, Vilnius)**

Dovilė KRUPICKAITĖ (Lithuania)

The problem of neighbourhoods of blocks of flats built in the Soviet years is gaining relevance: not only the quality of flats has been deteriorating (especially in the oldest neighbourhoods) but also the environment is out of keeping with the demands of the present residents (lack of parking lots, green areas, resting-places and infrastructural objects, etc.). These circumstances entail gradual social degradation of residents. Privatization of tenements yet insufficient skills of tenants to see after the communal ownership and lack of legal liability for communal property are serious obstacles for renovation of tenements even under very favourable conditions. There is a question how to enable the communities of neighbourhoods of blocks of flats in the post-Soviet countries to take the responsibility not only for the personal (and communal) property but also for the environment as well so as to implement a complex renovation of neighbourhoods. The Vilnius Municipality has undertaken to solve this issue through the pilot project "Žirmūnai triangle". In order to find out the attitudes and requirements of the tenants of the neighbourhood, a survey of residents (including children and teenagers) was conducted. The presentation contains the obtained results of the survey.



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**Socio-Spatial Trends in a Post-Transformational Metropolis City Centre: Simultaneous Degradation and Gentrification?**

Konstantin AXENOV (Russian Federation)

Two dimensions of post-socialist urban transformation - socio-spatial restructuring and changes in urban morphology - are still present in the urban cores of such cities as St.Petersburg. The process of transformation has produced certain peculiarities of the general modernisation trends. Unlike in majority of the cities, the historic centre of a post-transformation metropolis has witnessed the struggle of two trends: residential gentrification and social degradation - simultaneously. Obviously, none of the processes became dominant over the studied period; nor balance between the two trends was reached. Obviously, none of the processes became dominant over the studied period; nor balance between the two trends was reached. In its turn, that formed fundamentally different types of spatial behaviour of those social groups prevailed in the centre. Most likely, such a social contrast does affect the closing of space within and around the buildings with more intensity the higher the income status of those living in that buildings. This example shows that two dimensions of ongoing post-socialist urban transformation mentioned above are closely interrelated – social shifts are actively changing physical urban landscape.



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**Biopolitics of religious construction projects in Moscow, Russia**

Meagan TODD (United States of America)

This paper examines religion and biopolitics in Moscow, Russia. The shift from scientific atheism to a secular democracy promising freedom of religion has resulted in a well-documented growth of religiosity in multi-confessional Russia. One effect of this growth of religiosity has been increased demand for places of worship. In Moscow, Orthodox and Islamic practitioners are both underserved by religious infrastructures, with one church per 35,000 residents and one mosque per 3 million residents respectively. However, Moscow's current mayor Sergey Sobyanin has implemented a plan to construct over 200 churches, while he has opposed plans to build new mosques, explicitly citing the Islamic population of Moscow as transient and illegal. Moscow's religiously diverse population includes an estimated 2 million Muslims out of 11.5 million residents, but only four mosques serve Islamic practitioners. Drawing from 9 months of ethnographic fieldwork in Moscow, I argue that religious construction is a tool used by the government to regulate the creation of an Orthodox population. Biopolitical rationale seeks to maximize life while protecting populations from security threats. Religion reconfigures the logic of biopolitical security by asking how not only life but also spirituality are targets of governmental and social interventions. As religious and government leaders seek to increase the role of the Russian Orthodox Church in everyday life, the suburbanization of the Orthodox Church is a spatial solution to a politico- spiritual goal. However, the increasing visibility of Islam challenges monolithic narratives of Moscow as an Orthodox city.



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**Of angels and devils: Involvement of homeowners in Berlin's neighborhood development**

Robert KITZMANN (Germany)

After 1990, the structure of Berlin's tenant's market changed significantly. Housing privatization decreased the municipal stock massively: 19 companies with 482.000 units were diminished to six companies with 273.000 units until 2012. Financial investors found their way into the market, buying stocks of several thousand units or entire companies. Apart from arguments of tenant displacement due to rent increase, critics caution against the city's dwindling influence on neighborhood development. Since the new investors pursue a strategy of return and investment and profit-taking, they are rather interested in profit maximization than in sound and vital neighborhoods. Subsequently, the disposal of the more active municipal housing companies and their housing stock leads to situation in which homeowners are no longer available as important support for neighborhood development processes. The following study examined the involvement of different housing owners (first of all private vs. municipal) in the development process of 33 neighborhoods in Berlin. The results do not fully support the stereotypes of ambitious public and disinterested private owners but show a rather diverse picture. Involvement of owners is less depended on their legal status but on other determinants.

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**Regional features of expansion of selected negative deviant social phenomena**

Elena DEMIDOVA (Russian Federation)

The study of the social deviance expansion is "new ground" for the Russian socio-economic geography. Social deviations are understood as the complex socially important phenomena manifested in to stable (in time and space) forms of human activities that do not meet the performance standards and/or expectations. The most important endogenous characteristic of deviant activities is their focus: the deviation can be both negative (all types of crime, suicide, drug addiction, etc.) and positive (socially significant creativity in all its diversity: art, music, science, technology, etc.). Also social deviations differ in the degree of latency depending on the evidence of the ultimate impact and results. The least latent forms of negative deviant phenomena that have sufficient factual basis for carrying out a comparative study are intentional homicide and suicide. Examination of these deviance types worldview demonstrates their uneven spread in different regions of the world. Over 460.000 willful murders committed in 2012, more than 2/3 occurred in Latin America and Africa. Thus, the level of violent deaths in these regions are two to three times higher than the worldwide average. It is significant that in the Asian countries comprising more than a half of the world population, there is less than 1/4 of the global violent murders, and the murder rate in Asia is over two times lower than the world average. Radically different picture emerges with regard to suicide: about 800,000 suicides committed in the world in 2012, and the Asian region accounts for about 2/3 of them. At the same time, regional indicators shows low oscillations about the world average (10-20% plus or minus). Comparative visual and correlation analysis of data on the level of homicides and suicides do not indicate any strong association between these characteristics. Also, contrary to popular belief, both indicators do not show statistically significant correlation with the level of national economic development. The annex contains two maps ("Homicide level in the world (2010-2012)"; "Suicide level in the world (2012)") and four tables.A Study of the Spatial Distribution of Ethnic Minority Migrant Workers in the Urbanization in Urumqi City of Xinjiang



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# A Study of the Spatial Distribution of Ethnic Minority Migrant Workers in the Urbanization in Urumqi City of Xinjiang

Dong YE (China)

Abstract: With the advancement of urbanization, migrant workers have become the main force of city construction, on the other hand they also become vulnerable groups in the city, and should be paid close attention to by society and government. In the article, through field investigation in the five ethnic minority community in Urumqi, the status quo of the ethnic minority migrant workers, including spatial distribution, employment, income, living environment, housing, were learned in-depth. It was found that spatial distribution of ethnic minority migrant workers was suburb-orientated The most pressing survival problems of the ethnic minority migrant workers in Urumqi were explored. According to these problems, the suggestions for future development were put forward.



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# Spatial Feature and Formation Mechanism of Low-income Stratum in Old District of Guangzhou during Transitional Era

Zhou CHUNSHAN, Cai SHUIQING (China)

Urban Social class in China gets more and more diversity during the transitional era, and the low-income stratum in being one of the important strata. Located in the front of Chinese reform and open area, Guangzhou's development is far more advanced to other cities in China, and is now in the key transitional turn; during this turning, there are residential, employment, medical, education problems, which make the study of low-income stratum in Guangzhou significant. Based on the Sixth census of population, this paper gives a research on low-income stratum of residential in Guangzhou by factor analysis method; furthermore, the factors and mechanism of low-income stratum differentiation in Guangzhou was studied through the field and interview works. The main conclusions include: Firstly, the spatial differential of social strata in Guangzhou are affected by 6 factors, which are mid-income population, low-income population, agricultural population, mid-high-income population, mid-low-income population and intellectual population. With these factors affecting, 6 agglomerated areas are formed, which include low-income stratum area, mid-income stratum area, mid-high-income stratum area, agricultural stratum area, intellectual stratum area and mixed area. Within these areas, the low-income stratum enclaves' area include Beijing street, Renmin street, Daxin street, Shamian street, Duobao street, Lingnan street and Hualin street. Secondly, the spatial differential of social strata in Guangzhou display a "circle-sector" pattern, which show features following: Low-income stratum located in the core area of old city; beside that is the mixed and mid-income areas; outer next is mid-high-income stratum area, intellectual stratum area, mid-income stratum area and agricultural stratum area distributed as sectors; and intellectual stratum area also inserted into the mid-income stratum area and mid-high-income stratum area. Thirdly, features of low-income stratum area include: Old urban district location, high-density population, aging population, low education, old buildings, low infrastructure, bad environment; occupation are mainly about selling and service; road and street are crowded. Finally, the factors affect the formation mechanism of spatial differential of social strata in Guangzhou are following: Path dependency, Dan-Wei pattern and welfare-oriented public housing system, housing marketing and reform, urban renewal and reconstruction, family life cycle and individual resident model.



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## Degrowth: A Solution Towards Sustainability?

Daljeet KAUR, Sanjay TRIPATHI (India)

Where the developing world is struggling with the concepts of "Sustainable Growth", some developed countries are looking at the notion of "Sustainable Degrowth". The concept of "Degrowth" as a developmental paradigm appeared during the 1970s, proposed by the Club of Rome. In theory, Sustainable Degrowth is downscaling of production and consumption that increases human well-being and enhances ecological conditions. However, in practice it is more debatable, as the developed world is finding ways to reduce its production but not its consumption, which is leading to over exploitation of the resources in the Global South (GS). Sustainable Development (SD) has become a worldwide paradigm, whereas degrowth which proposes a solution more relevant for today's time, hasn't spread the way its counterpart has. The believers of Degrowth concept consider SD as oxymoron, for according to them one cannot envisage development without exploiting resources. Whereas, the critics of Degrowth argue that slowing of economic growth would result in increased unemployment and increase poverty especially in the GS. On the other hand, degrowth proponents advocate for a complete abandonment of the current (growth) economic system, suggesting that delocalising and abandoning the global economy in the GS would allow people of the South to become more self-sufficient and would end the overconsumption and exploitation of Southern resources by the North. The problem we face today may not have a simple solution but a combination of many solutions, which will help the world to move towards a sustainable being. Thus, today, the decisions makers, and communities themselves have a vital role to play when adopting a particular approach to tackle developmental issues. One such approach is collaborative consumption, which works on an economic model of swapping and sharing. The perpetual pursuit of growth, which at present is individualistic, if carried collectively can help achieve outcomes desired under the theory of Degrowth.



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**Urban-planning «risk-concept»: contemporary challenges and issues of sustainable development**

Konstantin KIVVA (Russian Federation)

Due to the high quantity of wide natural and natural-anthropogenic catastrophic events during past few years in Russia, the necessity of the shift between the paradigms of «town planning safety» to the «risk-concept» has risen. Under the paradigm of «risk-concept» we understand association of knowledge on assessment of risks and their account during the town-planning activities. Current research is aimed at the determination, description, and understanding of the role of population safety and environmental comfort factors influencing the life of towns. Those factors are crucial for the smooth functioning of the main life support systems in the towns. They are various in regard to the spatial and temporal range indicating features of certain town area, so we used general as well as regional approaches. The objective of the presented study is formalization of the main theses for urban-planning «risk-concept» as well as determination of its position in the system of town-planning forecasts in Russia. In order to fulfill this aim, several tasks were identified including (1) analysis and classification of urban-planning natural and anthropogenic «risk-factors» on the basis of degree of hazard for the health of citizens and life-supporting environment, (2) statement of suggestions on urban-planning risk decrease and risk forecast in case of any objectionable situation, and (3) assessment of possible contribution of «risk-concept» to the formation of safety and comfort life environment in Russian towns in the future. Implementation of the concept will allow for (1) the development of the system of preventive efforts aimed at decrease of possible severeness of situations on the regional and interregional level, (2) the value of comfort improvement and health promotion for the socio-ecological (living) environment at the phase of design, and (3) the well-substantiate long-term directions for spatial development of the country. Taking the above mentioned abilities of proposed concept, the late may be concluded as the necessary condition and base for the negotiation of the modern challenges and issues for sustainable development in Russia.



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**Rapid ecological assessment of green spaces using easily accessible remote sensing data: A vegetation analysis of 7 arid and semiarid cities**

Francisco DE LA BARRERA, Nicole ALVARADO-BARRERA, Stefan STEINIGER (Chile)

Globally, cities tend to biotic homogenization. However, urban areas in extreme climates may break this pattern because they could incorporate native species that are better adapted to arid conditions. We utilize a fast and inexpensive way to survey the vegetation of urban green spaces of seven arid and semiarid cities in Chile. These urban areas are located approximately between 18° and 30° southern latitude, covering a distance of about 1300 km. A sample of green spaces was selected to identify tree composition, tree abundance and other ecological attributes based on images from Google Street View. Furthermore, for each city we analysed over a time span of 13 years changes in NDVI (normalized difference vegetation index) using satellite images obtained from the MODIS Land Subsets platform. For the seven cities we discover that tree composition of evaluated green spaces is fairly homogeneous, containing three dominant trees, two of them of exotic biogeographic origin: Washingtonia filifera (Linden) H. Wendl, Phoenix canariensis Hort. ex Chab, and a third one native of the geographic region: Schinus molle L. The NDVI increases from north to south (more arid to less arid). One city shows a positive trend in vegetation dynamics, with a growing vegetation cover, and three cities show a decreasing trend for the last 13 years. Only 18.9% of the recorded tree species in green spaces are native. A little proportion of them is well adapted to little irrigation and should be promoted by national and regional institutions.



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**Research and environmental assessment of the New Moscow territories: a cartographic approach**

Elena PROKHOROVA, I.K. LURIE, E.A. BALDINA, S.V. CHISTOV, A.I. PRASOLOVA, V.N. SEMIN
(Russian Federation)

The territory of Moscow increased its area 2.4 times, after the land to the southwest of the capital with rather low total population has been adjoined to the city in 2012. Change in the status of the adjoined territories alters their economic, social and geographical position, the configuration of transport network, increase in house-building and population of settlements, change in land use, the increasing anthropogenic load on the environment, etc. In regard to this the Cartography and Geoinformatics department of the Lomonosov Moscow State University in 2013 launched a project aimed in creation a series of maps for integrated environmental and geographical land assessment of the new Moscow territories. This implies the development of information support for a comprehensive assessment of natural and human-made environment, the intensity of land use and population occupancy with the aid of geotechnology and online technologies, including geoprocessing operations and remote sensing data, implemented in geographic information system (GIS). The first scientific and methodological research and mapping results cover three key areas: 1. developing the structure and content of the thematic geodatabase with identifying the information products and the research question of current natural environmental and economic mapping; 2) elaboration of methods for remote sensing data application, including the use of very high resolution images of visible range for detailed mapping and thermal imagery use for the thermal structure of the territory revealing; 3) implementation of a pilot web-based application for the development of geoinformation and online technologies to place and visualize the created maps and other temporal and spatial information, presented in the geodatabase.



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**Recreation area's spatial analysis and planning in the urban green structure of Karaganda city, Kazakhstan**

Indira AKYLBEKOVA, Tatiana ZENGINA (Russian Federation)

The importance of open green areas in Karaganda city is very high because of the need to mitigate the mining impacts, as well as to create the fine and healthy living conditions. Today a sufficiently large part of the urban landscape in Karaganda city is represented by mining badlands formed as a result of the Karaganda coal basin development. In cause of this and adverse forest growth conditions, the development of recreation area's network is extremely complicated. For today urban greening and disturbed lands rehabilitation for recreational use is one of the most important environmental and social problems of Karaganda city. Within the framework of the conducted research Karaganda recreation area's spatial analysis and planning was based on the different scale mapping by methods of GIS-mapping and remote sensing. Also statistical and cartographic documents of different planning authorities and field studies materials were widely used. Verification of the satellite image interpretation was done during on-site investigations. As a result of undertaken study, Karaganda land use structure including recreational complex was analyzed in details. On the basis of gathered materials a large-scale map "Current land use in Karaganda" was prepared. Suggested approach allowed to identify a potential urban areas for recreation activities and can be applied for others industrial cities with the similar physico-geographical conditions as in Karaganda.



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**Urban parks contribution to the sustainability of urban environment: a case study Tel Aviv-Jaffa**

Helena ZHEVELEV, Sara PARIENTE (Israel)

Urban parks are poly-functional open spaces intended for optimization of the physical and social environment. This study aimed to investigate the relations between the soil properties and the socioeconomic profile of the populations in the parks in Tel Aviv-Jaffa. The city was divided into three geographical regions (South, Central, North), that reflect the course of city development from south to north, and differ in their socio-economic status. Thirty seven parks were chosen, in random, and divided by size into three groups: small, medium and large (2-10, 10-20, 20-50 dunam, respectively). In each park soil was sampled in four microenvironments (lawn, picnic, path and peripheral area of park), from three depths. For each soil sample, penetration depth, pH, electrical conductivity, and organic matter, sodium and chlorine contents were determined. The results were analyzed with respect to four factors: size of park, city region, microenvironment and soil depth. Penetration depth and organic matter content showed similar trends: highest values were found at the peripheral areas. The values of these properties increased with increasing size of park. Lowest values characterized picnic and path microenvironments. Electrical conductivity varied among the microenvironments. The visitors' number increased with increasing size of park, albeit the visitors' density decreased. The results are attributed to variations in the intensity of visitors' pressure and type of anthropogenic activity, which is affected by the socioeconomic status of citizens living in the park neighborhood. The peripheral area provides additional possibilities for increasing the sustainability of urban environment.



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## Chemical fractionation of heavy metals in urban soils (the Eastern District of Moscow)

Dmitry VLASOV, Natalia KOSHELEVA, Nikolay KASIMOV (Russian Federation)

A study was undertaken to investigate fractionation of heavy metals (HMs) in urban soils of the Eastern District of Moscow where multisource pollution problems occur. 21 samples of the urban soils were collected using a regular grid with 1 km spacing and a reference sample representing background uncontaminated soils (podzoluvisols) located at the distance of 200 km to the east from the city. Each sample was digested with HF+HClO4+aqua regia for the analysis of total HMs content and also partitioned into 5 fractions using sequential extraction procedure (Tessier et al., 1979): F1 – exchangeable (MgCl2); F2 – bound to carbonates (CH3COONa); F3 – bound to Fe/Mn oxides (NH4OH•HCl+CH3COOH); F4 – bound to organic matter (HNO3+H2O2); F5 – non-silicate residual (aqua regia). The concentrations of HMs were determined using ICP-MS. The concentrations of HMs in the fraction bound to silicates (F6) were calculated as the difference between the total and F1+F2+F3+F4+F5 concentrations. The results show that in the urban soils the significant proportions of Cd, Mn, Zn are associated with Fe/Mn oxides; while lower percentage of these metals are held in other fractions. Co, Ni, As, Pb, Cr, Mo, Be, Bi, Sb are mostly bound to non-silicate residual and silicate fractions (> 60%), but the amounts of the metals associated with organic matter and Mn/Fe oxides are also high (~10-20% each). About 90% of V, Ti, Fe, Sn are found in F5 and F6. The significant proportions of W and Cu are bound to organic matter. The potential mobility factor (PMF) for each element was calculated: PMF=(F1+F2+F3+F4)•100%/C, where C is the total content of a HM in a sample. The results show that PMF in urban soils increases in order: Cd > Mn, Zn, W > Cu, Pb, Mo, Sr, Cr, Co, Ni, As > Be, Bi, Ag, Sb, V, Fe > Ti, Sn.



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**Regulation of territorial conflicts using territorial capacity approach**

Galina GLADKEVICH (Russian Federation)

Usage of territory is a way of its engagement in a functioning of society. Type of territory usage is considered as a way of satisfying specific needs of society and is called "feature space" (Mintz, Preobrazhensky 1970). A functional space exhibits uniqueness, individuality, originality which are characteristics of any territory, in addition to its general geographic properties (Sharygin, 2010). The social significance of territory use varies. Priority areas are such functions that preserve its biological productivity: environmental, agricultural, recreational, forestry, and so on. Evaluation of specific functions for a place must take into account the whole set factors and cannot be conducted from perspective of one. Scientific substantiation of ecological capacity is based on calculation of optimal ratio of intensively exploited natural and protected areas to ensure ecological balance. Formation of conflict areas leads to the lower efficiency of territory usage and, in some cases, to the destruction of traditional forms of its economic activity. Spatial elimination of conflict areas matters. It creates "buffer" zones between antagonistic functions. Buffer zones are designed to "absorb the impact" made by a territory with highly intensive functions. The latter, acting interactively, will contribute strikingly to the systematic growth of territorial capacity.



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**Population decline effects on age structure: evidence from Russian shrinking cities**

Vera EFREMOVA (Russian Federation)

The urban system of Russia is on the way to concentration of population and economic potential in the limited number of centers. The downside of this process is the extension of the group of cities that are experiencing population decline, loss of economic performance and their role in the settlement system as a central place. The loss of population has different consequences for urban development. The main aspect is the change in age structure due to selective migration. This study examines the age structure of Russian declining cities with different economic base, central functions, pathway of migration and economic development in the previous decades. The analysis is based on the microdata of the censuses 2002 and 2010. The figures are summarized through the descriptive evaluation of the percentage of the main age groups and the overview of population pyramids. The results show that the cities with a significant population decline differ in their age structure. The main difference is formed by the features of the past demographic and migration development. Cities located in the regions with a long history of industrial and urban development are affected by the lasting outflow of population into metropolitan areas. Cities mostly developed in the Soviet times under the conditions of strong government regulation in the form of redistribution of population for the large-scale industrial projects usually have a significant share of the certain age cohort. These findings strengthen the imbalance in age structure due to population loss. The typology of cities based on the correlation between the age structure and the economic development is suggested. The consequences for the school and health services, social care and housing policy are considered.



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**Historical center and their integration in urban dynamics in the euroregion Galicia (Spain) -North Portugal (Portugal)**

Ángel Miramontes CARBALLADA, Teresa Sa MARQUES (Spain)

The problems of historic centers have already begun to be studied for decades, but the debate on this issue has continued to this day enriched by contributions from different specialists and the emergence of new challenges to face. So in this paper an evaluation of the achievements and unfinished business of accomplishments for the recovery of historic centers in an area of southern Europe is performed, in the northwest of the Iberian Peninsula belonging to Spain and Portugal: the Euroregion Galicia - North of Portugal.



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**An Investigation of the Contributing Factors to the Emergence of Terrorism in the Middle East: A Case Study of ISIS**

Qumars YAZDANPANAH DERO (Iran), Mohammad mahdi NAMDARI (Iran)

Terror and terrorism associated with anti-intellectual and anti-human function, have been used as a tool to advance political and geopolitical objectives. generally speaking, ethnic and religious background, illiteracy, cultural poverty, unemployment and foreign policy of some countries, are among the factors contributing to the formation and survival of terrorist groups. considering the human evolution and its civilization, it is expected that human beings do not experience terrorosm in their societies and countries. But intrigues and suppors from certain countries that benefit from the activities of terrorist groups has caused massive panic among people particularly those living in the Middle East. . The Middle East has turned into a center for training and operation of such groups in a way that both domestic background and foreign conspiracy have contributed significantly to the formation and activities of these terrorist groups. Today news of ISIS as a terrorist group appears in almost all headlines of news programs. As it was the case with Taliban and Saddam Hussein, they will be destroyed after fulfilling the objectives of those who produced them. as it has always been the case, the inhabitants of the middle east, prticularly the poor will be the main looser of this process. Here, the main question is the issue of the reasons and the ways through which terrorist groups came into existence and more importantly, why such groups are legetimized to operate and gain supports. Accordingly, public opinion has been constantly faced with an incongruity between politicians' words and their actions. The current study attemts to, after a review of the history of the emergence of such groups, investigate the conditions that led to the development of such terrorist groups including ISIS. Important issue is hidden hands that are charitable for newborn terrorist groups until they reach maturity and realize their goals for while.



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**Transformation of the Patterns of Suburban Development in Post-Soviet Saint-Petersburg**

Maria PODKORYTOVA (Russian Federation)

The collapse of the Soviet Union led to the deep transformation of economic and social life of the cities. The new conditions of market economics effected all components of the city development. Considering the transformation of the suburbs of Saint-Petersburg, we are concentrated on the suburban functions. Functional specialization was considered as one of the core aspects of the Soviet city planning, especially the planning of suburbs. The Soviet term "satellite town" demonstrates the specificity of the Soviet suburban planning. Suburb is considered to have a strong connection to the city but is planned to have the functional specialization of its own. After the collapse of the Soviet Union rapid growth of the suburbs is being observed but at the same time the functional specialization faced deep transformation. Every of the suburban functions had been effected by the new challenges of marked economics that modified it's spatial patterns. The suburban zone of Saint-Petersburg has 6 main branches of specialization: 1) Residential; 2) Industrial; 3) Recreational; 4) Agricultural; 5) Infrastructural; 6) Military. Every of these branches is to be studied from the point of view of city space transformation. Some functions, like housing, were growing rapidly; some, like agricultural, could hardly bare the challenges of market economics. All the functions were deeply and differently effected by the transformation and as the result the patterns of suburban development changed dramatically.



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**Assessing the impact of social and environmental conditions for urban planning in Moscow**

T. VOROBYOVA, N. MOGOSOVA (Russian Federation)

Intensive urban and economic development leads to changes in functional planning of the territory. Comprehensive study of the existing use and ecology of the urban environment is necessary for making decisions on urban space optimization. This study can detect the negative effects of human impact and solve social and economic problems within the city. The area of the research is located in the south of the city. Due to its social and planning features - high population density, large territory occupied by industrial plants, location between two major highways - this part of city was included in the "zone of development" with purposes of ecological and social infrastructure improvement. The socio-ecological assessment of the urban area within the developing zone carried out on the ground of the GIS, developed and compiled by the authors. The database of GIS consists of six blocks, including cartographic and attribute information with characteristics of the environment, functional planning and socio-demographic features of the territory. Differentiation of the territory on the various living conditions has been completed based on analysis of the ecological and social infrastructure. As a result of the research, the territory was revealed the number of people, living under critical ecological conditions with lack of social infrastructure. It is about 25% of the total population. Changes in the structure of functional zoning should be held in places of the greatest social discomfort, and should be aimed to reorganization of industrial territories and increasing public facilities and recreational territories. The studies were conducted with the support of Russian Foundation for Basic Research (project 15-05-01788 A)



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**Urban Entrepreneurialism and poverty invisibilisation: local resistances to "repulsive urbanism"**

Christophe MAGER (Switzerland)

Increasing competition between European major cities in the global economy has led to significant changes in their governance. It has shifted from 'managerialism', which essentially focused on providing more collective services to address socio-economic urban problems, to 'entrepreneurialism', assuming, in a neoliberal perspective, that dealing with urban issues must imply a simplification of the regulatory framework and the implementation of a planning system more supportive of chrematistic growth and public-private partnerships. To attract capital and allow collective planning gains, cities have favored market-oriented reforms and urban transformations aimed at fostering property and land values. This resulted in pro intensification policies maximizing land use and developers profitability, often in the name of sustainability. Despite this new governance, the urban fabric has not prevented–in a depressed European economic context–the socio-spatial inequality from persisting nor intensifying. Even cities advocating a sustainable urban agenda are no exception. As a result, most of European major cities have been confronted to contestations of current urban policies, leading to struggles fuelled by social, economic and planning issues. One of the most controversial entrepreneurial urban policy is that related to the desire of invisibility of poverty in the central public spaces, including the transformation of street furniture and planning, ensuring that the stationarity of the socially most vulnerable/less desired populations (homeless, idle youths, marginals, etc.) will be rendered difficult or impossible, through peaks installed under bridges or in front of the building halls, benches segmented by armrests, separate seats, etc. Raising questions concerning the right to the city, these practices are subject to resistance in various Swiss and French cities, showing the importance of citizen mobilization to resist the imposition of a neoliberal and hygienist vision of urban planning on the local landscape. We will sketch some local specificities of the modalities of actions of weak (e.g. local communities) advocacy groups against strong ones (e.g. authorities, developers, elites) to oppose such urban planning projects.



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**Spatial and Formation Mechanism of Low-income Stratum in Old District of Guangzhou during Transitional Era**

Chunshan ZHOU, Shuiqing CAI (China)

Urban Social class in China gets more and more diversity during the transitional era, and the low-income stratum in being one of the important strata. Located in the front of Chinese reform and open area, Guangzhou's development is far more advanced to other cities in China, and is now in the key transitional turn; during this turning, there are residential, employment, medical, education problems, which make the study of low-income stratum in Guangzhou significant. Based on the Sixth census of population, this paper gives a research on low-income stratum of residential in Guangzhou by factor analysis method; furthermore, the factors and mechanism of low-income stratum differentiation in Guangzhou was studied through the field and interview works. The main conclusions include: Firstly, the spatial differential of social strata in Guangzhou are affected by 6 factors, which are mid-income population, low-income population, agricultural population, mid-high-income population, mid-low-income population and intellectual population. With these factors affecting, 6 agglomerated areas are formed, which include low-income stratum area, mid-income stratum area, mid-high-income stratum area, agricultural stratum area, intellectual stratum area and mixed area. Within these areas, the low-income stratum enclaves' area include Beijing street, Renmin street, Daxin street, Shamian street, Duobao street, Lingnan street and Hualin street. Secondly, the spatial differential of social strata in Guangzhou display a "circle-sector" pattern, which show features following: Low-income stratum located in the core area of old city; beside that is the mixed and mid-income areas; outer next is mid-high-income stratum area, intellectual stratum area, mid-income stratum area and agricultural stratum area distributed as sectors; and intellectual stratum area also inserted into the mid-income stratum area and mid-high-income stratum area. Thirdly, features of low-income stratum area include: Old urban district location, high-density population, aging population, low education, old buildings, low infrastructure, bad environment; occupation are mainly about selling and service; road and street are crowded. Finally, the factors affect the formation mechanism of spatial differential of social strata in Guangzhou are following: Path dependency, Dan-Wei pattern and welfare-oriented public housing system, housing marketing and reform, urban renewal and reconstruction, family life cycle and individual resident model.



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# C12.40 Water Sustainability

## Hydrological processes and management of stressed water recourses 1

**Chairperson(s):** *Frank WINDE, Maria KIREEVA*

- Analysis of water balance components in the upper Vaal River catchment (South Africa) using a land surface model
  *C. CASSARDO (Italy), A. BAHRANI, R. BONANNO, I. CERENZIA, E. HOFFMAN, F. WINDE (South Africa)*
- Geografical factors of parametrization of a river drain from continents
  *Maria GRECHUSHNIKOV, Konstantin EDELSHTEIN (Russian Federation)*
- Mass changes in the hydrological basins of Russia from GRACE
  *L. ZOTOV (Russian Federation)*
- Investigation the dynamic and functioning of the Cheboksary reservoir (Volga River)
  *Inna NIKONOROVA (Russian Federation)*

## Hydrological processes and management of stressed water resources 2

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- Integrating regional climate, hydrologic, and ecosystem models for streamflow allocation in arid watersheds in Northwestern China
  *Chansheng HE, Lanhui ZHANG, Juan GU, Baoqing ZHANG (USA)*
- Hydrological characteristics typical of the basin of a small Middle Don river
  *Denis SOLODOVNIKOV, Sergey KANISCHEV, Valery ZALEPUKCHIN, Nikolay VISHNYAKOV, Vera BODROVA, Pavel PLYUSCHENKO (Russian Federation)*
- A Study on Channel Migration Process of Kundil river in Sadiya Region, Assam, India
  *Ratul DAS, Barnali GOGOI (India)*
- Extremal rainfall flood in Russian submountain regions
  *Natalia SELEZNEVA (Russian Federation)*

## Hydrological processes and management of stressed water recourses 3

**Chairperson(s):** *Frank WINDE, Maria KIREEVA*

- Predicting the fate of dried-up springs due to mining-related dewatering of a karst aquifer using a Darcy-based approach
  *Frank WINDE, Aljoscha SCHRADER, Ewald ERASMUS (South Africa)*
- The difficulties of snow modelling in complex environments: the case of the Alps
  *Claudio CASSARDO, S. TERZAGO, G. BALSAMO (Italy)*



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- Water use within transboundary basins in Russia and Kazakhstan (the case of Irtysh basin)
  *Nataliya FROLOVA, Valeriya IVANOVSKAYA (Russian Federation)*
- Estimation of water impact on water reservoirs from switch to variable level of pre-flood drawdown
  *Alexey Aleksandrovskiy, M. S. Podolskiy (Russian Federation)*

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**Chairperson(s):** *Frank WINDE, Maria KIREEVA*

- Discharge decline, hydric availability, risks and vulnerability in the low Paraíba do Sul River, Rio de Janeiro, Brazil
  *Adriana Filgueira LEITE (Brazil)*
- Hydrological Regime-based Flood and Drought Prevention Method for Lakes with Seasonal Water Level Fluctuations in Monsoon Regions – A Case Study of Poyang Lake, China
  *Guishan YANG (China (Beijing))*
- Changes of rainfall characteristics and water hazards over the past fifty years in the Pearl River basin, South China
  *Yongqin David CHEN (China (Hong Kong))*

**Modeling, VGE and GIS applications in hydrological research 1**

**Chairperson(s):** *Claudio CASSARDO, Chansheng HE, Mikhail SAMOKHIN*

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  *Frank WINDE, Emile HOFFMANN (South Africa)*
- Gradient-based algorithm for computing basic hydrological parameters from gridded DEMs
  *Sergey KOSHEL, Andrey ENTIN (Russian Federation)*
- Experience of maximum discharge estimation of river in Moscow region, based on classic and GIS methods
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**Modeling, VGE and GIS applications in hydrological research 2**

**Chairperson(s):** *Claudio CASSARDO, Chansheng HE, Mikhail SAMOKHIN*

- Modelling of urban areas inundation for large rivers of Russia
  *Alexey SAZONOV (Russian Federation)*
- Sensitivity Analysis Considerations of Surface Energy Balance System (SEBS) Input Parameters Used for the Estimation of Daily Evapotranspiration



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*Petros GIKAS, Mohamed ELHAG, Ioannis MANAKOS, Zisis PETROU, Maria FARAZAKI, Ioannis CHOURDAKIS (Greece)*

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- Spatial Dimensions of Drinking Water in an Agriculturally Prosperous State Haryana, India
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**Water quality, health and human impacts 2**

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- A novel multi sorbent for simultaneous removal of pollutants
  *Ali MAHDAVI MAZDEH (Iran), Anahita ESMAELIAN (Iran), Hossein GHAFORIAN (Iran), Tatiana BIBIKOVA (Russian Federation)*
- Seasonal Change in the water quality and dissolved oxygen of the inundated forest in Lake Tonle Sap, Cambodia
  *Hideo OYAGI, Hang PEOU, Shinji TSUKAWAKI (Japan)*
- The Impact of Environmental Regulation on the Migration of Pollution Industry in Chinese Guangdong Province
  *Jing SHEN, Huang SHUANGSHUANG (China)*

## POSTER EXHIBITION

**Water quality, health and human impacts**

- Water and Energy: Small Hydropower Plants and the Conservation of Vegetation Coverage in the State of São Paulo - Brazil



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*Edson Alves FILHO, SANTOS FILHO, Gildo MAGALHÃES, Giorgia LIMNIOS, Sueli* Ângelo *FURLAN (Brazil)*

- Local flow systems of confined groundwater as inferred from spatial changes in chemical properties – A case study in the Tertiary hill in the Tokai District, central Japan

  *Akihiro MITA, Hideo OYAGI, Kazuki MORI (Japan)*

- Urbanization, water management and water quality trends in Danshui River watershed, Taiwan

  *Mei-Hui LI, Chia HSIEH (China)*

- Water resources management for sustainable agricultural development in rain shadow areas of Indapur Tahsil, Maharashtra (India)

  *Bhaskar Ishwar GATKUL (India)*

- Anthropogenic transformation (1962 - 2007) of alkali metal ion runoff in the Mudyuga river and the Yarenga river of Arkhangelsk Oblast

  *Dinara KHAYRULLINA (Russian Federation)*

**Hydrological processes and management of stressed water resources**

- Analysis of long-term changes in the water level regime of the Lower Amur

  *Natalia YUMINA (Russian Federation)*

- Short-term flood forecasting for the rivers of the Black sea coast of Caucasus

  *Natalia YUMINA, A.V. KHRISTOFOROV, P. A. BELYAKOVA (Russian Federation)*

- Ensemble's method in the spring flow long-term forecasting for the rivers of the Northern Dvina's basin

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- Volga Delta: Dynamic Plattern Ability Hydrological And Climatic Factors For Change Natural And Antropogenic Condition

  *Alexander BARMIN, M.V. VALOV, M.M. IOLIN, N.S. SHUVAEV, E.A. KOLCHIN, A.V. SINTSOV, A.I. KOMAROV (Russian Federation)*

**Modeling, VGE and GIS applications in hydrological research**

- Research of dynamics of river flow with application of hydrometeorological models

  *Victor ZHUK, Natalia EFREMOVA, Zoya SYCHILINA (Russian Federation)*

- Total and glacier runoff in the Vakhsh and Panj river basins (Pamir region) in normal and extreme years

  *Vladimir KONOVALOV (Russian Federation)*



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IGU2015 – 1315

# Estimation of water impact on water reservoirs from switch to variable level of pre-flood drawdown

*Alexey Aleksandrovskiy, M. S. Podolskiy (Russian Federation)*

In a course of long-term usage of water reservoirs their conditions change due to anthropogenic and climate factors. To reflect such changes it is proposed to change parameters of reservoirs by switching to variable level of pre-flood drawdown by using preliminary hydrological forecasts of inflow. Water effect is computed for Volga-Kama cascade of reservoirs, for low-inflow years with p>75% it amounts to additional flow of 6 cubic km (about 10%).



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# Analysis of water balance components in the upper Vaal River catchment (South Africa) using a land surface model

*C. CASSARDO (Italy), A. BAHRANI, R. BONANNO, I. CERENZIA, E. HOFFMAN, F. WINDE (South Africa)*

In South Africa the hydrological risk is important from a social, economic and political point of view. Causes are twofold: the natural aridity and the increase of water request due to industrial and population necessities. Present and future climate changes are expected to reduce water resources in many parts of the country. In the frame of the ongoing collaboration between the Mine Water Research Group (MWRG) from the North-West University (South Africa), expertise on researches about deep water quality, and the research group of the University of Torino, expertise in modelling and climate science, both belonging to the IGU Commission on Water Sustainability, a study aimed to evaluate the past and present hydrological balance from a climatic point of view on a large part of South Africa has been carried out. More specifically, since in the metropolitan agglomerations in and around Gauteng Province, water resources, relying on water from the Vaal River, are approaching their limits of economically viable exploitation, a deeper analysis has been performed in the upper Vaal River catchment. The analysis has been conducted using the land surface model UTOPIA, developed by one of the authors, and has concerned the main components of the hydrological budget: precipitation, evapotranspiration, surface runoff, intermediate runoff and underground drainage. As input data for UTOPIA, ERA-INTERIM and GLDAS datasets have been used. The preliminary results obtained will be presented during the congress and will support future hydrological studies performed with more sophisticated models and methods.



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## Geografical factors of parametrization of a river drain from continents

*Maria GRECHUSHNIKOV, Konstantin EDELSHTEIN (Russian Federation)*

The multi-scale phenomena of circulation of substances and energy form a continental hydrological cycle. The importance of the zonal and azonal geographical factors (orographical, hydrographic, meteorological, hydrological, hydrochemical) defining features of cycles of different continents is significantly various. In the territory of the continents located in several climatic zones transformation of streams of atmospheric moisture by orographical factors has prime value. It is important to consider it making models of climatic changes of a river drain on the basis of forecasts of air temperature and rainfall changes with the use of global climate models. Dependence of external and internal water exchange structure of donor-continents and continents-moisture interceptors on orography undoubtedly serves as the reason of distinctions in their potential and real water resources. The intensification of an internal moisture circulation peculiar to continents -moisture interceptors increases problems of floods scales restriction and water deficit decrease. Their decision seems only in more and more deep regulation of a river drain, in its interbasin and interzonal redistribution by means of difficult water management systems. The solution of these problems can be reached at integrated and correct approach to an assessment of consequences of already carried out water management projects in various geographical conditions. The correctness of such estimates is impossible without quantitative analysis of the reasons of the observed environment changes in areas of transformation of a drain; separate calculation of climatic changes, growth of various forms of anthropogenous load on continental hydrological cycle, on catchment areas and water objects which isn't connected with hydrotechnical construction for spatio-temporal regulation of a drain. The work is supported by RSF (project 14-17-00155).



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**Mass changes in the hydrological basins of Russia from GRACE**

*L. ZOTOV (Russian Federation)*

Space gravity measurements from GRACE are used to study mass variations in the major hydrological basins of Russia from 2003 to 2015. Slow changes reflect permafrost degradation and secular variations in the mass accumulation. Annual component response to climate variations and particular hydrological anomalies can be also studied. GRACE data can be used to improve floods studies and predictions.



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**Investigation the dynamic and functioning of the Cheboksary reservoir (Volga River)**

*Inna NIKONOROVA (Russian Federation)*

Cheboksary reservoir was formed by the hydroelectric dam of the same name on the river Volga in 1981. Since 1981 it exploited on unplanned water-level mark - 63 m instead of 68 m on the project. As a result, the ships are not provided with the necessary depth for river transport, hydro-systems of power station do not operate at full capacity. There is formed an extensive area of shallow water in reservoir that does not correspond to sanitary norms. Then anxiety affects to the base of bank protection structures and destroys them. At the same time, the rise of the reservoir level would flood vast areas of the Nizhny Novgorod region, Mari and Chuvash republics. There proposed various options to further the reservoir. Each of versions requires a thorough examination. In any case, will the restructuring of aquatic and coastal geosystems of reservoir, due to which needs careful monitoring for them. Operation of the reservoirs on the unplanned level - is the Russian specifics. In addition to Cheboksary Reservoir in the same mode there is Nizhnekamsk Reservoir. Obtained from Cheboksary reservoir model-analogs can be used to determine the specificity of like him. Cheboksary reservoir youngest on the Volga, and is still poorly known. Not sufficiently covered issues of forming its water masses, hydrodynamics and exogenous geodynamics on the coast. Department of Physical Geography and Geomorphology of the Chuvash State University studied it since 1992. There are obtained results of monitoring banks, geoecological study of water masses and coastal geosystems, defined zones, types and extent of its recreational use.



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**Integrating regional climate, hydrologic, and ecosystem models for streamflow allocation in arid watersheds in Northwestern China**

*Chansheng HE, Lanhui ZHANG, Juan GU, Baoqing ZHANG (USA)*

High elevation and cold mountain ranges are the main sources of runoff for the downstream agricultural oases and desert ecosystems in the inland river (terminal lake) basins in Northwest China. This paper proposes a framework to integrate regional climate model, hydrologic models, and ecosystem models for allocating streamflow among the upper, middle, and lower reaches of arid watersheds to meet the multiple demands for water, including rehabilitation of downstream ecosystems. The proposed framework includes: 1) simulation of effects of climate variability on water resource distribution in the study watershed; 2) estimation of water demands for domestic supplies, consumptive uses, and ecosystem services; 3) development of water allocation criteria; and 4) implementation of the water allocation plan. The advantages of the proposed framework are: 1) spatial integration; 2) multiple objectives; 3) incorporation of local needs through participatory decision making; and 4) dynamic evaluation. The proposed framework is being applied to the Heihe watershed, a large inland (terminal lake) watershed in Northwestern China, to analyze the current water allocation plan issued by the State Council of China. To address the increasing water conflicts among the upper, middle, and downstream users, stakeholders from different levels of governmental agencies and private institutions need to be fully engaged in applying and evaluating the proposed framework to ensure the sustainable use of water resources at the watershed scale.



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**Hydrological characteristics typical of the basin of a small Middle Don river**

*Denis SOLODOVNIKOV, Sergey KANISCHEV, Valery ZALEPUKCHIN, Nikolay VISHNYAKOV, Vera BODROVA, Pavel PLYUSCHENKO (Russian Federation)*

In 2014, has been studied main river Small bend of the Don – Bolshaya Golubaya (Big Blue) river. This river is a right tributary of the Don, at a distance of 538 km from the estuary flows into the Upper reach of the Tsimlyansk reservoir near the village Bolshenabatovsky. The river's length is about 27 km, catchment area of 720 km2. According to literature data, the annual runoff is estimated at 0,0033 km3/year at the river flow 0,107 m3/s. Systematic hydrological observations on the river is not conducted. The river in the summer has an unusual color of the water with slightly turquoise shade. The river bed is covered by alluvial sediments of sand and chalk pebbles. The water surface some shallow pools much overgrown with macrophytes (pondweeds, duckweed and other). Almost the entire shoreline protection zone of the river is covered with tree and shrub riparian vegetation. Hydrochemical indicators of the water in the river belongs to the first and second grades of purity. The source of the river is 5 km North-West of the hamlet Golubinsky-2 and represents a plot with an area of approximately 200 m2, on the surface of the leaves several springs hollow type with almost stagnant water. The main source of water supply throughout the year groundwater Cretaceous (Cenomanian) of the aquifer. Direction of the river is crossed by dirt roads in places fords. There are a total of 5 fords. In June 2014 hydrological surveys conducted in the basin of the Bolshaya Golubaya river. The obtained characteristics are significantly larger than the data found in the literature. In the upper reaches of the river (3 km below the source) channel width was 4 meters, the maximum depth is 63 cm, the velocity is 0.23 m/s. When square living section of 1.41 m2 estimated river flow amounted 0,32 m3/s. In wellhead target Bolshenabatovsky village the width of the river is 52 m, depth is over 2.18 m. The river flow was 2.2 m3/s. Thus, instrumental certain low-water consumption was more than 20 times appearing in the literature, the average annual consumption. The only tributary of the river - beam Sukhaya Golubaya (Dry Blue). When the average flow velocity in 0,018 m/s water flow through estuarine target was only 0,016 m3/s. In the river basin identified 28 existing springs. This is almost 2 times smaller than marked on a topographic map the 1950s, there is no doubt that many springs ceased to exist when the redistribution of surface and underground drains and General climate warming. Springs formed in uniform geological conditions, but the discharge varies greatly. In spring discharge the springs best averaged is 2 l/min, in the summer is about 0.5 l/min. In the basin of the Bolshaya Golubaya river is located about 30 ponds of various sizes, built in the Soviet era. Operates only 10 ponds, dams destroyed the rest. The device ponds the most primitive, dams are simple earthen dam without culverts.



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**A Study on Channel Migration Process of Kundil river in Sadiya Region, Assam, India**

*Ratul DAS, Barnali GOGOI (India)*

Channel migration is common in alluvial channels, but the rate of migration and processes involved vary from channel to channel. The Kundil River is an important tributary of river Lohit, flowing through the alluvial plains of Sadiya in the easternmost part of Assam, India. In this present study an attempt has been made to investigate the rate of channel migration and associated changes of the river for the period from 1945-2014. By analysing topographical maps and satellite imageries of different years (1976 to 2014) using ARC-GIS and ERDAS, it has been found that there are significant changes in the course of the river in Sadiya region. The processes involved in lateral shift of the river channel can be grouped into four categories: 1. alteration of the direction of flow due to chute cut-off, 2. alteration of the direction of flow due to neck cut-off, 3. widening of a channel in response to bar development, 4. progressive shifting of meander bends. The bank line shift and the other changes of the Kundil River have been determined separately for the periods 1945-1988, 1988-2014 and 1945–2014. Fifteen cross sections are considered at an interval of approximately 3 kms to measure the bank line shifting. Maximum bankline shifting measured up to 1.80km is found during 1945-1988. However, the migration is not unidirectional all throughout the channel but a rightward migration has been observed in some segments. The area eroded due to bank line migration along the entire course is highest in the period from 1945-1988. Large discharge and heavy sediment load during floods cause the river to be extremely unstable, because of which it constantly migrates laterally over its floodplain. The sinuosity index of the river changes from time to time. It is maximum in the year 1976 with a value of 1.74 and minimum 1.24 in the year 2001. Keywords: Channel migration, cut off, meandering, Kundil River, Sadiya.



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## Extremal rainfall flood in Russian submountain regions

*Natalia SELEZNEVA (Russian Federation)*

Rainfall flood is the most natural hazard. Russian Far East, North Caucasus and foothills of the Sayan Mountains are the most probably susceptible regions of the Russian Federation to the rainfall flood's impact. Mountain rivers cumulate rainfall runoff on hillsides and strike a blow for the urban lands which are located at overflow area. Elevation of floodwave and blow energy depend on the kind of direct surface flow (slope of basin, forest coverage and others); quantity of channel inflow; location of lateral inflow, where the areas exposed to flash-floods (urban centre, built-up area, cultivated land) are situated. Topographical and hydrological factor analysis and statistical information of depth of precipitation make possible to recognize more risky zones, where damaging flood is expected. Distinctive historical rainfall floods (on the River Amur inflows, North Caucasus rivers, inflows in upper reach of Yenisey River) confirm a role and meaning of factors specified upper. Analysis of flank of hills' impact on flood forming makes possible to introduce the most effective and environmentally safe methods and resourses of flood prevention. For the ensuring of flow-off dispersion and peak flow decrease the time serve of prechannel flow and next following controlled flow to floodplain are employed. For the emplementing this scheme the most of easy to construction and sufficiently effective facility is the establishing self-regulating filter dams or dams equipped with culvert spillway, which are create temporary water-collecting areas. The employment of local materials for construction of dams (made of stone, sandbags, brushwood) allow to create efficient and environmentally perfect system.



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# Predicting the fate of dried-up springs due to mining-related dewatering of a karst aquifer using a Darcy-based approach

*Frank WINDE, Aljoscha SCHRADER, Ewald ERASMUS (South Africa)*

In order to economically mine rich gold deposits located underneath water-filled dolomitic karst, deep level gold mines in the Far West Rand (South Africa) intentionally drained the overlying aquifer by not returning the pumped out water from the mine void to the aquifer it originated from at rates exceeding the natural recharge. Owing to the gradually lowered water table, springs located at the upstream side of dykes dried up. Since mining penetrated the dykes at the level of the mine void, which is in turns is hydraulically connected to the overlying compartments via faults and fractures, it was predicted that a single large 'mega-compartment' would form once mining stops and the mine void floods. Since the water table in such a mega compartment would be controlled by the spring of the lowest lying downstream compartment and thus remain significantly below its original elevations in the joint upstream compartments, all dried-up springs would remain so forever. Owing to the grave consequences of such a scenario for post-mining land use and economic development of the area, this study aims to critical test the underlying hypothesis of a mega compartment be formed. To this end a conceptual model was developed which in essence compares calculated flow rates across the pierced dykes (i.e. losses or outflow of a compartment) with their respective recharge rates (i.e. inflow) in order to determine the net water balance for each of the joined compartments. After confirming that historical pumping rates recorded by the dewatering mines correspond with observed changes of water table elevations in the compartments as predicted by Darcy's law, Darcy-based methods could be justifiably applied to the karst system. The dewatering of the aquifer resembles an ultra-large pumping test which can be described with standard analytical equations commonly used to derive values for (horizontal) transmissivity, hydraulic conductivity and storage coefficients. A total of four different analytical methods were applied to three sets of data in order to increase the robustness of the results and account for specific local conditions. The different data sets each represent the aquifer during different stage of dewatering with the drawdown of the groundwater table ranging from 0 m to approximately 600 m below the original water table). This allowed to obtain results for distinctly different vertical zones of the dolomite, each characterised by different degrees of karstification. Most obtained values were in good agreement with results from previous investigations in the study area as well as values found in literature for similar aquifer types implying that – at this (large) scale of investigation, homogenous porous media-derived methods can be meaningfully applied to multi-porosity karst aquifers. Since determined recharge rates by far exceed water losses through pierced dykes for each of the three joint compartments, it is concluded that water tables in compartments will gradually rise until they reach their original elevations again allowing all dried-up spring to flow again.



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**The difficulties of snow modelling in complex environments: the case of the Alps**

*Claudio CASSARDO, S. TERZAGO, G. BALSAMO (Italy)*

The peculiar physical properties of snow differ significantly from those of other Earth's surfaces like soil or canopy. For this reason, a complete model for studying momentum, heat and water vapour exchange processes at the atmosphere-soil-vegetation interface must take into account snow processes. However, reliable modeling of snowpack temporal evolution in high elevation regions is complicated by the high spatial and temporal variability of the meteorological parameters, the complex topography, the low representiveness of surface observations, and the uncertainties in the measurements. Thus, often the snow variables directly produced by regional and global climate models and/or by reanalyses can be scarcely representative of the local conditions, and direct forcing of local snow models could provide better results. Conversely, the direct forcing requires a rigorous assessment of the model sensitivity to the temporal and spatial resolutions of the forcing variables, and high-quality observations. In this study, we address specifically the latter point by investigating the sensitivity of selected snow models to the spatial/temporal resolution of the input data. The analysis of the obtained results will demostrate which is the most sensitive parameter among input data.



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**Water use within transboundary basins in Russia and Kazakhstan (the case of Irtysh basin)**

*Nataliya FROLOVA, Valeriya IVANOVSKAYA (Russian Federation)*

Complex analysis of water-management problems is necessary for cost-effective and environmentally safe water use in transboundary river basins. Contradictions between bordering countries concerning water resources use and preservation are inevitable in transboundary river basins. These contradictions cause interstate tension, impede cost-effective and environmentally safe water use. This calls for selection of objective criteria for the situation assessment. Requirements for hydroecological safety control for each sort of water use may be stated as the number of conditions expressing limits of acceptable range of water object state parameters during estimated period. Some hydroecological restrictions are determined by natural conditions; variations of these conditions may be foreseen with some degree of credibility to avoid negative consequences. Other part of restrictions arises in the course of anthropogenic activities and is specified by water users. Hydrological restrictions of water use in the Irtysh basin are examined. This region is one of the most complicated in terms of water management for Russia and Kazakhstan. Examined restrictions include assessment of water supply deficit, characteristics of water objects contamination based on different water quality indexes, and assessment of negative effect of dangerous hydrological phenomena. Complex assessment of hydrological restrictions specified as “norm”, “risk” and “crisis” for given territory is made. Obtained results may be used for improvement of water management plans, setting of acceptable anthropogenic impact on water objects; determination of future requirements in water resources. The study was supported by the Russian Science Foundation (grant No. 14-17-00155).



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**Discharge decline, hydric availability, risks and vulnerability in the low Paraíba do Sul River, Rio de Janeiro, Brazil**

*Adriana Filgueira LEITE (Brazil)*

Campista Lowland is an area situated in the north part of Rio de Janeiro State, whose landscape corresponds to a wide floodplain, where we can find the low Paraíba do Sul river, the most important one of the Brazilian southeast region. This site is known for its sugar cane agribusiness heritage and, since the 1980s, for hosting petroleum exploration activities in Campos Basin. The rainfall and discharge data analyses, from the mentioned river, that have been obtained from the Campos dos Goytacazes gauge – one of the most important economical cities of the region – show that, in spite of droughts being part of the local scenario, the risks and vulnerability suffered by the population, in relation to hydric availability, has been becoming worst over the last six decades. In this sense, it can be observed that while the size of population of the city has doubled during the interval of seventy years, increasing from 225.443 inhabitants in 1940 to 463.731 inhabitants in 2010, the minimal discharge frequency (between 118 and 644 m3/s) has also risen without a correspondent decrease of the local rainfall total. This fact seems to have relation with the several landscape transformations that happened between the middle and the low course of the river, over the last two hundred years, and mainly with the fluvial deviations destinated to the electric power generation and to reservoirs. Finally, considering that in 2010 only 41% of Campos dos Goytacazes's population were met with sanitary sewage services, it can be observed that, although there is a trend of decline of the hydric availability, most of untreated sewage is still sent to the same fluvial source from where the water is caught for consumption, that is to say, the Paraíba do Sul River.



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**Hydrological Regime-based Flood and Drought Prevention Method for Lakes with Seasonal Water Level Fluctuations in Monsoon Regions------A Case Study of Poyang Lake, China**

*Guishan YANG (China (Beijing))*

As the water level fluctuates sharply in shallow lakes in monsoon regions, a unique landscape is formed: the lake overflows during flood season and shrinks into a stream in drought season. These dramatic changes in water regime, the prevailing pattern of water flow over a given time, are crucial to flood and drought control, the protection of water resources, the nearby environment as well as the sustainable development of the regional economy and the health of the ecosystem. Since the Three Gorges Project was put into use, the drought in Poyang Lake, the largest freshwater lake in China, had caused widespread concern; local government intended to launch the Lake Control Project to tackle the water shortage problem, which sparked controversy. Based on statistical analysis of the hydrological data over the last 60 years, this paper will reveal the patterns of water level fluctuation in Poyang Lake at various time scales. This will establish a set of methods for seasonal water level assessment and provide a basis for forecast, warning, prevention and control. The study found that water level fluctuations in Poyang Lake vary significantly according to season: dry, rising, wet and recession. Based on the normal distribution theory and the statistical distribution of water fluctuation data, characteristic values of water level like flood control and water supply in Poyang Lake are all used to determine the secure water level thresholds. We found that the dekadal scale of seasonal water level fluctuation is the most accurate; in addition, the lake water regime security status during certain periods of time can be dynamically assessed using this time scale. Thus, warning systems can be deployed in time and disaster prevention measures can be taken. When lake water environment and water ecology security threshold assessments are included, the accuracy of the predictions will improve. Based on the hydrological regime, this lake water security assessment method that makes use of multiple time scales and targets could provide new methods for measuring other seasonal lake level fluctuations.



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**Changes of rainfall characteristics and water hazards over the past fifty years in the Pearl River basin, South China**

*Yongqin David CHEN (China (Hong Kong))*

Using daily precipitation data covering 1960–2005 from 42 stations across the Pearl River basin, precipitation indices, defined by annual total precipitation amount, annual total rainy days, annual precipitation intensity and annual mean rainy days, are analyzed using the modified Mann–Kendall trend test method. Results indicate that: (1) decreasing precipitation is found mainly in the middle and upper Pearl River basin. However, a decreasing number of rainy days is detected almost over the entire basin. Thus, the Pearl River basin is characterized by increasing precipitation intensity, particularly in the middle and the eastern parts of the basin; (2) the occurrence and fractional contribution of wet periods (WPs) with longer durations are decreasing in recent decades and WPs with shorter durations, e.g., 2–5 days are tending to be predominant in recent decades with increasing total precipitation amount. Frequencies of shorter WPs with increased total precipitation amount can be expected, which can easily trigger occurrence of floods and droughts; (3) heavy precipitation is easy to occur in WPs with shorter durations which may further corroborate the intensified precipitation process in the Pearl River basin, particularly in the lower part. Reduction of water supply from the upper Pearl River basin due to decreased precipitation and higher risk of floods and droughts in the lower basin will increase uncertainty of water supply in the lower basin and hence pose new challenges for water supply and water resources management under the influence of climate change and human activities, such as increasing water demand as a result of the booming socio-economy and rapid population growth.



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**Virtual Geographical Environments (Vge) As A Tool To Map Human Exposure To Mining-Related Radionuclides – A Case Study From South African Goldfields**

*Frank WINDE, Emile HOFFMANN (South Africa)*

The deposit of large volumes of uraniferous gold tailings in densely populated metropolitan areas has created the potential for large, widespread exposures to mining-related waste including radionuclides in South African goldfields. Epidemiological studies are being considered that would evaluate whether mine-related pollution is related to adverse health outcomes in surrounding populations. As a first step, a feasibility study has been designed to measure U-levels in human biological samples and to determine the magnitude of these levels according to different residential and lifestyle characteristics. Design and implementation of this feasibility study, specifically selection of appropriate study populations, rely on an understanding of the distribution of U and related contaminants in the environment. To this end, a comprehensive database was compiled using a freely available VGE to map human exposure to mining waste across the entire Witwatersrand basin. Thousands of data points mostly consisting of U and 226Ra concentrations have been extracted from a multitude of largely unpublished sources and subsequently geo-referenced. In order to reduce visual complexity all data were categorised into five classes depicting increasing levels. Class breaking values are derived from existing benchmarks (e.g. guidelines, limits) as well as natural background concentrations for the various media (water, sediments, soil, food, biota, human samples etc.). Apart from showing spatial patterns of pollution (e.g. hotspots) the system can also display selected exposure pathways including inhalation (based on modelled dust plumes from tailings), drinking water (tap water as well as streams and groundwater where applicable) and ingestion via the food chain. For assessing risks posed by geophagia and pica-behaviour U and 226Ra-levels in tailings, soil, and sediments are also captured. These data can be superimposed on settlements in the affected areas displaying latest census information down to suburb level allowing researchers to estimate the total number of potentially exposed people, overall and by different demographic factors. The use of a popular VGE platform allows the database to be easily queried without special training.



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## Gradient-based algorithm for computing basic hydrological parameters from gridded DEMs

*Sergey KOSHEL, Andrey ENTIN (Russian Federation)*

At the present time, many algorithms are proposed to compute flow directions, catchment areas and flow accumulation volumes on gridded digital elevation models. Some of them are simply release water from one grid cell to another; others use special coefficients to distribute flow among neighbor cells. Evaluating the results of computation seems to be a difficult task. Many authors solve it through processing an "example model" (mathematical surface and/or real terrain) and comparing results. Instead of constructing ideal mathematical surfaces and trying to predict "theoretical" distribution of the parameter, we used the fact that water flows in the direction opposite to the direction of gradient vector. So, if we are able to determine gradient vector for each point of surface (not only for cells centers or corners of gridded DEM), we can construct a flowline from any source and then use a set of lines to compute catchment area and related parameters. Algorithm starts with a set of initial points (we use centers of grid cells, but any other variants are also possible). Coordinates of flowline vertices are computed as numerical solution of the differential equation. Resulting lines are then rasterized, assigning specific value for every cell. The value could represent a contributing area for the line or a share of water volume. At last, rasterized values are summarized to resulting grid. This approach is conceptually similar with Kinematic Routing Algorithm (also known as "rolling-ball method"), but uses different procedure for constructing a flowline.



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# Experience of maximum discharge estimation of river in Moscow region, based on classic and GIS methods

*Mikhail SAMOKHIN (Russian Federation)*

The maximum runoff is an integral indicator of landscape and climatic characteristics of the territory and their spatio-temporal variability. Maximum flow rates (primarily the maximum discharge) one of the main engineering limit for development situated in river valleys. Russian state standard methods of hydrological estimations formed about 50 years ago [SN-346-66]. Russian diversity of estimation methods in hydrology based on: 1) special conditions of maximum discharge; 2) large-scale generalization of spatial data (due to vast territory); 3) lack of field observations and a low density of monitoring network; 4) considerable engineering reserve in estimations. Implementation of GIS-technologies, remote sensing data (including satellite geodesy), mechanized monitoring stations, modern computing and modelling technologies hasn't been applied in the state-approved methods of maximum flow calculation till now. Analysis of the maximum rain and spring flood discharges has been done for 49 hydrological posts over the past 60 years (selected river with semi natural flow). Reduction is common trend of maximum water discharges for all rivers in the Moscow region. The Equations for depending of maximum discharge from reducing rates that reflect its natural regulatory mechanisms was corrected. Some maps of the hydrological characteristic's distribution has been updated and improved for the region. Investigation display that weaknesses in the current state of hydrological monitoring networks, associated with a lack of observational data first of all on small rivers of the region (F<100 sq.km.) and for the urbanized catchments. Research allows us to formulate the principles of network modernization and development of the methods for the maximum discharge estimation.



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# Modelling of urban areas inundation for large rivers of Russia

*Alexey SAZONOV (Russian Federation)*

Climatic features of our country cause the annual floods on rivers, accompanied by inundation of floodplains. Water level rise can reach up to 7-10 m and more above low-water level during this period. For assessment of potential damage and development of flood safeguard methods for settlements various methods of physical and mathematical modeling are used. The two-dimensional hydrodynamic model of overflow channels and inundated floodplain STREAM_2D on the basis of numerical solution of two-dimensional Saint-Venant equations on hybrid curvilinear quadrangular and rectangular mesh was used for simulations in our research. An important step in modeling of the flooded territory is the verification of the simulated and field data. An effective method to check the accuracy of the model is the Earth remote sensing use. By means of space images division of not flooded territories from covered with water by means of automatic classification of K-mean method is made. Flooded area, calculated on images and simulation results, was chosen as a parameter of the model calibration. Experimental work has been done on the Northern Dvina, Lena, Tom and Amur Rivers. To estimate simulation results different types of images: radar images (Radarsat-2), images in the near-infrared and visible range (SPOT-5), very high resolution images (EROS-A) were applied. Tested methods have shown good results (relative error did not exceed 15 %). The study was supported by the Russian Science Foundation (grant No. 14-17-00155).



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# Sensitivity Analysis Considerations of Surface Energy Balance System (SEBS) Input Parameters Used for the Estimation of Daily Evapotranspiration

*Petros GIKAS, Mohamed ELHAG, Ioannis MANAKOS, Zisis PETROU, Maria FARAZAKI, Ioannis CHOURDAKIS (Greece)*

Sensitivity Analysis Considerations of Surface Energy Balance System (SEBS) Input Parameters Used for the Estimation of Daily Evapotranspiration Petros Gikas*†, Mohamed Elhag**, Ioannis Manakos***, Zisis Petrou***, Maria Farazaki* and Ioannis Chourdakis* * School of Environmental Engineering, Technical University of Crete, 73100, Chania, Greece ** Department of Hydrology and Water Resources Management, Faculty of Meteorology, Environment & Arid Land Agriculture, King Abdulaziz University. Jeddah, 21589, Kingdom of Saudi Arabia ***Information Technologies Institute, Centre for Research and Technology Hellas, 57001, Thessaloniki, Greece † Corresponding Author, Tel.: +30 28210 37836, E-mail: petros.gikas@enven.tuc.gr Abstract Evapotranspiration is a fundamental process and should be taken into account in water resources management. Thus, accurate estimation of evapotranspiration is of primary importance for the planning of agricultural water management. The estimation of daily evapotranspiration on regional scale may be achieved by the use of Earth observation satellite data along with Surface Energy Balance (SEB) models. In this study, the SEB System (SEBS) model is used to estimate daily evapotranspiration and evaporative fraction over the Nile Delta using Advanced Along-Track Scanning Radiometer (AATSR) satellite imagery (acquired in August 2013) and meteorological data from 15 stations distributed in the study area. Estimated daily evapotranspiration values validated through regression analysis show good agreement with ground truth data, supporting SEBS applicability and accurateness in the estimation of daily evapotranspiration over agricultural areas. Sensitivity analysis has been performed to evaluate the influence of SEBS input parameters to the total uncertainty of the model outcomes. Comparative analysis of Gaussian process emulators has been employed to perform Sensitivity Analysis based on several metrological features used as SEBS input and taking into account their interrelations. Conclusions derived from the present work are anticipated to contribute decisively towards an inclusive SEBS input parameters assessment over its overall implementation.



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## Computer modeling of bed configuration for alluvial rivers

*E. FINGERT, A. ALABYAN (Russian Federation)*

A problem of depth determination by means of remote sensing images is of great practical value. The approach based on analysis of brightness and shades of the water area image could have a perspective only for lakes, sea gulfs, estuaries, and other water bodies with rather still water. In contrast, rivers with dynamically changing water level and turbidity need in essentially other decision. The theoretical base of the proposed technique founds on the mechanics of interaction of the flow inside quasi-stable banks with cohesionless bed. Bed forms are symptomatic of local variations in the sediment transport capacity, which can give rise to sequences of erosions and depositions. The adjustment of channel forms takes place under rather wide spectrum of water discharge, but the integral influence of the runoff could be characterized by dominant discharge usually defined using magnitude-frequency concept. The approach based on 2D hydrodynamic modeling of flow with moving bed appeared to be fruitful for large lowland rivers of various channel patterns. The strategy of modeling consisted in the following: for the initial time moment the channel outlines of the simulated river reach correspond to bankfull conditions and the bottom is flat; depth and sediment particle size are taken typical for the chosen river; bed deformations under dominant discharge passing are simulated until a quasi-stable condition of bed configuration is achieved. A number of simulations both for flume tests and for large Russian lowland rivers with mainly sandy beds (the Oka, the Moscow-river, the Northern Dvina, etc.) demonstrated realistic results. Side and mid-channel bars, riffle-pool sequences, confluence scours and other larger-scale features typical for meandering and braided channels, as well as river junctions were reproduced rather authentically.



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**Geographical and hydrological study of the water supply system of the Moscow metropolis**

*Y. DATSENKO, V.V. PUKLAKOV, K.K. EDELSTEIN (Russian Federation)*

Water quality in surface water sources - rivers, lakes and reservoirs - is influenced by two main factors - natural and anthropogenic. Therefore, the solution of practical problems of forecasting and study methods to regulate water quality is only possible with a thorough knowledge of the laws of its formation in natural water bodies and their catchments. The only way to obtain this knowledge - geographical and hydrological studies of water bodies that allow us to establish patterns of spatial and temporal changes in water quality and to develop methods of prediction and control the sources of water supply. The report presents the results of geographical and hydrological studies of water supply system of the Moscow metropolis, as a result of which were obtained by assessing the transformation of organic substances of natural origin in the system of reservoirs, a forecast of water quality at the water objects, demonstrated the possibility of adjusting the water quality on the Upper Volga and the causes of abnormal oscillation water quality. Modeling of hydro-ecological status of basic water supply - water reservoirs - prepared a forecast of the process of eutrophication and ways to regulate the quality of water during periods of abnormal meteorological impacts.



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**Spatial Dimensions of Drinking Water in an Agriculturally Prosperous State Haryana, India**

*Kuldeep SINGH (India)*

The supply of safe drinking water, one of the Millennium Development Goals and most important basic needs of life, is currently the major challenge before the governments in developing countries including India. Availability of drinking water directly or indirectly affects the health, education and earnings. Women and children bear the primary responsibility for drinking water collection in India. As per census 2011, in rural India 37.8 per cent households used tap water for drinking and 35.7 per cent used hand pumps, 7.6 per cent tubewells, 16.5 per cent wells and 2.4 per cent used other sources of drinking water. Haryana, the study area, an agrarian prosperous state, lies in north western part of India. The research is based on primary (Field Survey) as well as secondary data (Census of India and Public Health and Engineering Department etc.). The present research paper attempts to answer the following questions: How is the question of equity in drinking water addressed in an agrarian state in India? What are the policy interventions, technological progress and programmes in vogue to ensure safe drinking water across different parts of the state? In Haryana, 65 per cent population lives in 6841 Villages and more than one-fifth or 22 per cent population in village belongs to scheduled castes. Haryana is emerging as a modern state and has made tremendous progress in the availability of drinking water. While 63 per cent of rural households in rural Haryana using tap water as source of drinking water in 2011, and in 1981 it was only 20 per cent. Use of well water as a source of drinking water in rural Haryana has also been changed significantly. While it was 53 per cent in 1981 and it decreased at the level of 4.5 per cent in 2011. In common with physiography, there is a significant spatial disparity in sources of drinking water in rural Haryana. The 87 per cent households in Panchkula used tap water where as only 32 per cent households in Mewat district have access to tap water. In Mewat 18 per cent households used well water for drinking, top in Haryana and in Karnal it is only 0.1 per cent. While using the traditional sources of drinking water such as well, there is a deprivation and untouchability in various caste groups.



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**Challenge Of Integrated River Basin Management Of The Velika Morava River**

*Ana PETROVIC, Ana PESIC (Serbia)*

In the last decades, Serbia encountered the problem of drinking water supply, that influenced the public perception of the water crisis and initialized more intensive research on water resource preservation as well as the implementation of European Water Directive. One of the main requirements of the Directive focuses on integrated river basin management (IRBM), which is a complex task. Therefore, there is a need to collect data on water quality and quantity, specific and key issues of water resources management, pressures on river ecosystem, flood risks and erosion problems, cross-border issues, socioeconomic processes, agricultural development and protected areas, in order to recommend the measures for solving problems and pressures recognized in the basin. This paper focuses on analysis of specific pressures on river ecosystem and recommendations for integrated management of the Velika Morava river basin (the greatest national river basin), taking into the account European experiences in integrated river basin management.



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## Time trends of precipitation acidity, sulfur and nitrogen atmospheric depositions in Russian regions according to the monitoring of snow cover chemistry data

*Dmitry MANZON, Vladimir KUZOVKIN, Vladimir VETROV (Russian Federation)*

The paper presents results of snow cover chemistry monitoring in the Russian Federation. Monitoring grid consists of about 570 observation sites (OS) in all of which snow cover is sampled at the end of winter period. The average network density for the whole country is near 30 000 OS/km2, whereas in different regions it varies from 5 000 to 100 000 OS/km2. Snow chemistry data for the winter period 2012-2014 were used to calculate average square values of pH and sulfur and nitrogen deposition rates (kg/km2·month) in each of country regions. Maps of these figures were developed as well as regression analysis was carried out for 2000-2014 monitoring data to determine time trends of the figures both in industrial and remote regions. The overall regional distribution pattern of pH in snow cover shows absence of noticeable acidification of winter precipitations all over the country area. Assessments of time trends of sulfur and nitrogen deposition rates revealed relative stability of these indices in regions in the period 2000-2014.



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# A novel multi sorbent for simultaneous removal of pollutants

*Ali MAHDAVI MAZDEH (Iran), Anahita ESMAELIAN (Iran), Hossein GHAFORIAN (Iran), Tatiana BIBIKOVA (Russian Federation)*

The present work has been developed within the framework of the Panta Rhei Research Initiative of the International Association of Hydrological Sciences (IAHS) by the Working Group "Sustainable Water Supply in an Urban Change". One of the best ways for solving water supply issues is the use of industrial and agricultural wastewater for irrigation. However, wastewaters must be treated before use. Although many attempts have been done using various adsorbents, in most of them one sort of pollutant was tried to be removed. Industrial and agricultural wastewaters often contain both anionic and cationic compounds such as nitrate and phosphate, and heavy metals. So, to use previous techniques several treatment cycles for different kind of pollutants are needed. This is difficult and cost effective. Consequently any effort of using complex adsorbents other than these materials, which can have a simultaneous removal of both anionic and cationic compounds from wastewaters, would be of great importance. In this study a novel nano biopolymer alginate gel bead impregnated with surfactant modified zeolite and activated carbon has been developed for removal of mixed agricultural contaminants and examined using both equilibrium and kinetic batch studies on cadmium and nitrate, which are used as a representative of cationic and anionic compounds, respectively. The results have shown that this sorbent is more effective in cationic removal than anionic removal (56% of nitrate), by removing 99.8% percent of cadmium.



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**Seasonal Change in the water quality and dissolved oxygen of the inundated forest in Lake Tonle Sap, Cambodia**

*Hideo OYAGI, Hang PEOU, Shinji TSUKAWAKI (Japan)*

A development of the world heritage Angkor monument park in Siem Reap, Cambodia has been recently planned with a rapid increase of a tourist. Moreover, tropical lowland is a fragile area where global climatic change has a great effect on its physical environment. From such point of view, fundamental present data on physical as well as human conditions should be collected and scientifically analyzed. Inundated forest exist in Lake Tonle Sap, located in Siem Reap, by a water level change in the rainy and the dry season. In addition, the characteristic inundated forest is broadly distributed over the circumference shoreline in this lake. In this paper, seasonal changes in both concentration and constitution of nutrient substance and oxygen and around the area of inundated forest. The spatial distributions of dissolved oxygen of the surface water around the inundated forest were from 30 to 80% in the dry season. The water bed water measured from 30 to 80% in the dry season. Moreover, in the rainy season, its measured 30 to 80% in the surface water. However, the water bed water measured from 0 to 50% in this period. It is considered that the phenomenon of the decrease in dissolved oxygen is caused by the respiration in plants and no motion of water on the river bed water in the rainy season. These facts suggest that the bottom water in the inundated forest is the environment where dissolved oxygen is consumed on the river bed in the rainy season.



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# The Impact of Environmental Regulation on the Migration of Pollution Industry in Chinese Guangdong Province

*Jing SHEN, Huang SHUANGSHUANG (China)*

Following the process of Globalization, the researchers are more and more focus on the topic of pollution industries migration across country and state, which can be used for industry policies and environmental regulations. In this article, through analyzed the statistics data from 2000 to 2010 in Guangdong Province, located in the south-east of china, the characteristics evolution of spatial and temporal distributions of pollution industries has been found. The developing path of pollution industries has changed from steady to fast, and then steady liking an 'S'-shape. The spatial distributions of pollution-intensive industries have changed from decentralization to centralization and then decentralization. In addition, Nonmetallic industrial enterprises, among others, have dramatically relocated to the non-PRD area from the PRD area. It means that the international and provincial pollution-intensive industries migration have existed in Guangdong Province. Then, Panel data model is further used to find out whether environmental regulation is related to the migration of pollution industries. According to Weber's industrial location theory, the model is built with the proportion of the pollution industries output to those in Guangdong Province as the dependent variable, and the independent variables consider factors that influence the spatial distribution of the pollution industries, such as capital, wage rate, transportation, agglomeration and environmental regulation, and the variable of environmental regulation is the ratio of sulfur dioxide emissions to the provincial average value. The results show the mechanism of international industries migration is effect by environmental regulation. The strictness of environment regulation drive the pollution enterprises in Pearl Delta move away, but the laxer environment regulation in non-Pearl River Delta has effect the spatial distributions of pollution industries. In what follows, we bring the ratio of sulfur dioxide emissions to the average as the single variable for environmental regulation into the sector-specific panel data model, and discovers that the spatial distribution of pollution industry sector such as nonmetallic industry, water and electricity gas industry and paper-making industry are significantly influenced by environmental regulation, while other industries such as ferrous metal industry, Non-ferrous metal industry and chemical industry are unaffected by the environmental regulation. This result shows that China's energy saving and emission reduction policy which includes the sulfur dioxide emission reduction targets do work for the heavily air-polluting industries. Finally, the paper concludes with the following two points concerning the mechanism of environmental regulations for the location of pollution industries. (1) Environmental regulation has been an important locational factor in China, inasmuch as the local governments hope to upgrade the local industries with the help of environmental regulations under the context of fiscal decentralization. (2) The impact of environmental regulations on industry location depends not only on the industry character, but in the Chinese context also on the regulative means aimed for specific environmental goals.



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**Water and Energy: Small Hydropower Plants and the Conservation of Vegetation Coverage in the State of São Paulo - Brazil**

*Edson Alves FILHO, SANTOS FILHO, Gildo MAGALHÃES, Giorgia LIMNIOS, Sueli* Ângelo *FURLAN (Brazil)*

Abstract The water scarcity in state of São Paulo (Brazil) during the period of 2013-2015 presents a risk of shortages in the major urban areas. The vegetation that has been suppressed for decades has compromised water conservation as well as energy security - a fact identified in a series of field expeditions under the project "The History of Electricity in the State of São Paulo (1890-1960): Industrial Heritage, Landscape, and Environment – Electro-memory II". There was a considerable decrease of the water volume in almost rivers that serve the 32 hydroelectric power plants surveyed to date - a situation that affects the generation of energy. According the Environmental Quality Panel of the Department of the Environment of the state of São Paulo (SMA, 2014), the situation of the vegetation coverage in the 8 watersheds where there are the small hydropower plants indicates that only 2 plants present native vegetation above 50% in the watershed. Their reservoirs are supplied by rivers that pour from areas protected by law. Keywords: Small Hydropower Plants, Environmental Conservation, Watershed, Water Sustainability, Vegetation Coverage.



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# Local flow systems of confined groundwater as inferred from spatial changes in chemical properties – A case study in the Tertiary hill in the Tokai District, central Japan

*Akihiro MITA, Hideo OYAGI, Kazuki MORI (Japan)*

Groundwater plays an important role as vital resources for human beings in conjunction with water use for domestic, industrial and agricultural purposes. In order to sustain groundwater as a critical element in the available water resources, it is indispensable to make clear the mechanism of local, intermediate and regional flow systems of groundwater in the area concerned. In the study area, more than two hundreds artesian wells are distributed and have been still made good use of irrigation and miscellaneous affairs, in which the great majority were dug in the first half of the 20th century. The purpose of the present paper is to delineate the local flow systems of confined groundwater in the Tertiary hill in the Tokai District, central Japan, by employing water quality as a tracer. Hydrochemical investigations have been conducted for 39 observation wells, including 32 artesian wells, since August 2014 and the examination is still carrying over. The items of observation in situ include discharge of artesian well, water temperature, electrical conductivity, pH, DO and ORP of groundwater. After specimens were transported to the laboratory, the concentration of major dissolved constituents (sodium, potassium, calcium, magnesium, chloride, sulfate, bicarbonate and silica) was determined by means of ion chromatography, titration and/or colorimetric methods. One of the notable characteristics on chemical properties of groundwater is explained by the ratio of bicarbonate to total anion whose numerical value reaches approximately 90 percent. This fact indicates that confined groundwater in the study area has relatively long residence time. On the other side, the concentration of sodium ranges from 0.38 to 2.07 mmol/L, and its ratio to total cation shows the spatial difference with 45 to 85 percent. It is pointed out that the local flow systems of confined groundwater are restricted by geological structure as distinguished by anticline which occupies recharge area from precipitation and surface water.



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**Urbanization, water management and water quality trends in Danshui River watershed, Taiwan**

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Southeast Asia is a region with rapid urbanization and economic development in past several decades and is expected to have serious environmental problems of water pollution, water shortage and aquatic ecosystem degradation. Rivers play an important role in transporting water and materials through river systems in watersheds. Therefore, water qualities of river waters can be used as sensitive indicators in response to natural and anthropogenic changes within watersheds. Thus, it is necessary to have better understanding of effects of urbanization on water quality in this specific region. Danshui River watershed is located at a highly urbanized metropolitan region in northern Taiwan and includes three major tributaries, i.e. Dahan creek, Xindian Creek, and Keelung River. The domestic wastewater is the major pollution source of DanShui River watershed now; however, three tributary subbasins are with different wastewater characteristics and provide an opportunity to examine effects of different urbanization processes on water quality changes. River water qualities of water quality monitoring sites were examined to explore relationships between different urbanization processes and water quality problems. The seasonal Mann-Kendall test is used to detect trends of monthly water quality parameters at each water quality monitoring site during one (1997-2012) or two periods (1987-1997 and 1997-2012) depended on the data available from Environmental Water Quality Information database on Taiwan Environmental Protection Administration Web site. The urbanization processes and water management policies in the Danshui River watershed are discussed in relation to the changes of water quality trends during the past 2-3 decades.



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**Water resources management for sustainable agricultural development in rain shadow areas of Indapur Tahsil, Maharashtra (India)**

*Bhaskar Ishwar GATKUL (India)*

In India due to in agriculture sector there is rapid growth of agro based number of new industrial establishment has come up in the last three to four decade. Western Maharashtra in general and the Indapur in Pune district particular is no exception to this. There area because of its nearness to Pune metropolis has grown at a disquieting rate in term of agro-industry crating numerous environmental issues like air, water and soil pollution. Of these problems water contamination pose serious threat to human health. The work is aimed at adopting multi-parametric approach to advance the existing status of the knowledge on environmental agro-chemistry of soil and water resources in the sugar and agro-industry in Indapur Tahsil for studying occurrences and distribution of pollution. Agriculture already polluted by rapid general developed countries are more conscious about industrial pollution since India is developing country, impact of the industrial effluent on water recourses which affect upon soil degradation and water pollution. Therefore attention towards the industrial effluent and chemical pollution is topic of serious concern. Rapid urbanization and increasing concentration of the industries resulting in deterioration quality of the life water have undergone tremendous change in rural ecology and agriculture. Pollution of water resources poses a serious threat to human health and environment (Lake et al 2003) in urban and industrial areas surface sources of water are largely influenced by anthropogenic activities (Drangert and Cronin 2004). As most surface water sources are already polluted by rapid urbanization and industrialization, its adverse effect on shallow subsurface groundwater aquifers are also cause of concern as massive proportion of population is dependant on it both in urban and rural areas. Several studies have reported water pollution (Kayabali et al 1999, Karaguzel and Irlayici, 1998, Pawar et al 1998) by different anthropogenic sources. Although there is lot of information available on pollution issues in urban areas in many parts of the world ( Kayabali et al 1999: Jarvie et al 2000; Oguchi et al 2000 Jarvie et al 2002; Hiscock and Grischek, 2002, Lake et al 2003 etc.) Literature on industrial impact water resources of rural areas is sparse. Therefore, in order to suggest the option for remediation, it is desirable to have substantial recognition of important environmental predicament to formulate and implement a corrective policy. Whatever little data is available, are not sufficient enough to provide necessary information for assessment and management purpose. Hence there is need to embark on swot to collect data and document it for the purpose of scientific understanding



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and also for warranting counteractive measures. This information is vary vital as consumption of inferior quality of water application for has posed the risks to human health particularly in the surrounding villages, which are more dependant on surface and ground water as the main source drinking water. Sustainability basically refers to capacity to remain productive while maintaining the resources bsae (Reijntjese. At 1993). Soil productivity dropped continuously even in season of rain. El Tohami (1993) and El Mangouri (1985). Market instability affecting the prices are immediate in affecting agriculture and resource use. ( El Khalifa and Nour 1998). In view of the above information is proposed to undertake the studies on WATER RESOURCES MANAGEMENT FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN RAIN SHADOW AREAS OF INDAPUR TAHSIL, MAHARASHTRA (INDIA).



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**Anthropogenic transformation (1962 - 2007) of alkali metal ion runoff in the Mudyuga river and the Yarenga river of Arkhangelsk Oblast**

*Dinara KHAYRULLINA (Russian Federation)*

The paper deals with estimation of anthropogenic component of active water migrants (alkali metal ions) runoff of rivers located at different distances from the White Sea (the Mudyuga River - Patrakeevskaya village, the Yarenga River - Tokhta village) for the period from 1962 to 2007. The method of research is based on assessment of anthropogenic transformation of the ionic runoff. It consists of several approaches used by V.A. Belonogov and M.P. Maksimova. Statistically, the ionic runoff of the Mudyuga has the largest anthropogenic transformation of 62%. Conversely, this value is 44% on the Yarenga. This difference may be due to several reasons: the Mudyuga has the small proportion of groundwater flow (9.5%) in the total annual runoff. For this reason, river runoff exposed to external factors more. Therefore the pollutants can enter from industrial emissions, in particular from the Arkhangelsk-Severodvinsk urban agglomeration with atmospheric precipitation. In time (seasonal) aspect the maximum values of anthropogenic transformation of ionic runoff are observed during the spring flood on the Mudyuga (70%). More specifically, there is heating season in winter and overflow of karst water from other river basins. However, the maximum values are marked on the Yarenga during baseflow period in the summer-autumn (83%). Primarily, there is northern wind from marine waters in this period. Finally, the Mudyuga has less anthropogenic transformation between seasons than the Yarenga because the Mudyuga basin swamped more (19.6%), than the Yarenga basin (2%).



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**Analysis of long-term changes in the water level regime of the Lower Amur**

*Natalia YUMINA (Russian Federation)*

The study describes maximum water level in the lower reaches of the Amur River according to the factors of runoff in different parts of the Amur basin and Zeya river flow regulation. The analysis of water level changes during high-water season has been done, separately for the conditions of the natural flow variability (1955-1979) and after the start of operation of the Zeya hydroelectric complex (1980-2013). An average of 5 hydrological events contribute to the long-term water level fluctuations in the area of the Lower Amur (Komsomolsk-on-Amur). They are differed in the time of formation, duration and hydrological characteristics. The first storm corresponds to spring floods; the second – the fifth events are the result of loss of monsoon rains in the warm season. For given water stages of seasonal increase in water levels and flows the role of increased runoff, formed in the Amur basin in different years and during the absence or presence of the economic activity impact on the seasonal distribution of water flow, has been evaluated.



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**Short-term flood forecasting for the rivers of the Black sea coast of Caucasus**

*Natalia YUMINA, A.V. KHRISTOFOROV, P. A. BELYAKOVA (Russian Federation)*

Flood forecasting methods have been developed in order to prevent dangerous floods on the rivers Mzymta, Sochi, Zapadnyi Dagomys, Kuapse, Tuapse and Vulan, which flow from the southern slope of Caucasus the Black sea. Flood forecasting technique is based on a regional physical-statistic model of runoff formation. Such model allows providing river flow forecasts with use of available data from the only hydrological gauge and the only meteorological station within the basin also considering absence of data on snow cover. Runoff formation processes are simulated with the time-step of 1 day. Model parameters have been evaluated for each month separately. Verification methods for independent data showed sufficiently high accuracy and efficiency of the developed methods. The system of methods of probabilistic forecasting of floods with 1 day lead-time was proposed. Depending on the forecasted discharge value it lets evaluate probability of exceeding the critical discharge and water levels for the next day. A scheme for the computation of daily critical precipitation amount at the meteorological stations, which cause the exceeding with a given probability of critical discharges and water levels during the expected day, has been developed. Since 2013 the proposed forecasting system has been applied in an automated way in Hydrometcenter of Russia and is used for operational warning of dangerous floods on the chosen rivers of the Black Sea coast.



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# Ensemble's method in the spring flow long-term forecasting for the rivers of the Northern Dvina's basin

*Natalia EFREMOVA, Mikhail VARENTSOV (Russian Federation)*

Variability of the water flow's characteristics caused by complexity of spatio-temporal processes that generate it. Therefore, taking into account data for the prediction period has a significant place in long-term forecasting. Nowadays their current account can be conducted not only on the basis of meteorological forecast but also on the basis of ensembles - the possible realizations of the process. For example, in hydrological forecasting it can consist of probable spatio-temporal analysis of temperature and precipitation during the spring flood. This prediction method is made for rivers of the Northern Dvina's basin and it is based on the physically based semi-distributed hydrological model ECOMAG. Ensemble of each predicting spring flow included actual observed meteorological conditions of the current winter, connected one after another in different model's calculations with 45 spring-summer conditions, which we have seen in the past. The results of study show the high potential of the methodology in the assessment how the initial "winter" conditions may change. So in the different spring metrological conditions such as increasing the intensity of the average daily temperature and different moisture conditions there are significant differences in the values of the maximum water discharge and spring flow - minimum and maximum of their value may differ by 1.5 – 2 times, and the beginning of the flood may vary within 1 month. This method may be of importance in operational "every-year" practice of hydrological long-term forecasting in the context of climate changing and volatility forecasting techniques in modern conditions.



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# Volga Delta: Dynamic Plattern Ability Hydrological And Climatic Factors For Change Natural And Antropogenic Condition

*Alexander BARMIN, M.V. VALOV, M.M. IOLIN, N.S. SHUVAEV, E.A. KOLCHIN, A.V. SINTSOV, A.I. KOMAROV (Russian Federation)*

Condition and dynamics of land ecosystems and biotic communities of river plains and deltas to the greatest extent depend on the hydrological regime of the territory and climatic factors. Therefore, regulation of runoff dams and creation of reservoirs on rivers in linked with the climate change cause profound changes in the status and dynamics of delta ecosystems and landscapes, which leads to various negative consequences. They are especially great in arid areas, where the most productive valley landscapes. For identify changes in climatic and hydrological conditions in the delta of the Volga River authors calculated by decade dynamics mean annual air temperature, the average amount of temperature for the period with a temperature morethan 10 °C, the long term average jearly precipitation, hydrothermal coefficient of Selyaninov G.T., change in the average amount of precipitation for the period with temperatures morethan 10 °C, the volume of water flow in the alignment of the Volgograd hydroelectric power station, the percentage of flow for the second quarter of the total annual flow.



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**Research of dynamics of river flow with application of hydrometeorological models**

*Victor ZHUK, Natalia EFREMOVA, Zoya SYCHILINA (Russian Federation)*

At present analysis and forecasting of river flow are done, basically, with the use of mathematical models of different complexity. The important factor for selection of a model is the availability of the background information, in particular, models of river flow formation require as an input data the detailed meteorological information. The paper deals with the results of research of water regime of the rivers, done on the basis of joint application of a hydrological model of river flow formation, and of global and regional models of circulation of atmosphere. River basins with various areas of watershed, from 400 км2 to 375 000 км2 are considered. Evaluations of water discharges were made by means of informational-modelling hydrological complex ECOMAG. As input data in modelling complex were used: daily average values of actual meteorological observation data at the monitoring network (temperature of air, rainfall and humidity of air), the data of two meteorological models of climatic system MPI-ESM-LR and INMCM4 of the CMIP5 Project, the average data of the set of 11 meteorological models of the CMIP3 Project, the results obtained with the use of regional model of atmosphere circulation WRF. Verification of efficiency of hydrological and climatic models was done with the use of the real data of observations for recent time, and when the results were appropriate a situation analysis was carried out or forecasting of water flow was made. As a result of research it is established: - Modelling of processes of river flow formation for the present time by the means of the meteorological data of certain climatic models are ineffective; - At the use of the average data of the set of 11 models, outcomes of modelling of river flow, in general, are satisfactory, and such approach can be used at the analysis of tendencies of a modification of river flow in future; - The meteorological data received as the result of modelling on the basis of the WRF model, are adequate for river flow formation analysis and short-term forecasting of streamflow of the medium size and large rivers.



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# Total and glacier runoff in the Vakhsh and Panj river basins (Pamir region) in normal and extreme years

*Vladimir KONOVALOV (Russian Federation)*

Spatial and temporal variability of river runoff and its climatic factors (i.e., precipitation, air temperature, etc.) play a significant role in understanding of past, current, and future environmental conditions. It is especially true in extreme cases, such as low-water or high-water years that influence strongly water management and consumption and the needs of the population. For the rivers of the Aral Sea basin, both precipitation and air temperature are used as predictors in order to forecast seasonal and monthly runoff from the upper watersheds. Identification of their role in formation of extreme values of river runoff would help improving methods of hydrological forecasts in critical situations for water users. The main sources of runoff formation in the Amu River are melting of seasonal snow and long-term storage of ice and firn in the Pamir glaciers. At the beginning of 1960s, the area of glaciers in the upper watersheds of the Panj and Vakhsh, which form the Amudarya was estimated as 11,600 km2 or nearly 78% from the total glacier area in the Aral Sea basin. Combined analysis of long-term variability of the Panj and Vakhsh river flow components during May-October showed that relative contributions of glacial runoff and total melting increase in low flow years and decrease in high flow ones. This peculiarity of glacial runoff is very important for water supply to agriculture and hydropower in the Central Asian states, because it provides natural regulation of the intra-seasonal distribution of runoff. However, the stabilizing role of glacier runoff in the Amudarya basin is becoming less effective due to shrinkage of glacier area by 2324 km2 during 1961-2000. This is very significant and undoubtedly influences on sustainable availability and utilization of river runoff in the Aral Sea basin, especially in low water seasons. Temporal variability in seasonal volumes of glacier melt were estimated previously (Konovalov 1985, 2006) for the Vakhsh and Panj river basins during 1935-1994. It was revealed that characteristic feature of the temporal range in both basins is a decreasing linear trend of meltwater output. The present paper analyses the spatial variability of meltwater volumes VM for May-October in low and high water years.



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# C12.41 Geomorphology and Society

## Geomorphology and Society 1

**Chairperson(s):** *Jiun-Chuan LIN, Su-Min CHEN*

- Analysis Correlation Between Actual Landslide and Landforms Genesis in Sub-Watershed Merawu Banjarnegara Regency

  *Gerry UTAMA, Suratman WOROSUPROJO (Indonesia)*

- Assessment of Geomorphological Risk in the Republic of Belarus

  *Dzmitry KURLOVICH, Vladislav ROMANENKO (Belarus)*

- Complex assessment of geomorphological safety of Russia

  Ekaterina *EREMENKO,* Andrey *BREDIKHIN,* Sergey *BOLYSOV (Russian Federation)*

## Geomorphology and Society 2

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- The Adaption Of Urban Land Use To The Coastal Change Of West Taiwan

  *Jiun-Chuan LIN, Chia-Hung JEN, Yeuan-Chang CHENG, Chi-Jen YANG (Taiwan)*

- Estimation Of Population At Risk In Korean Coastal Area Using Dasymetric Mapping

  *Chanwoo JIN, Jongseo YIM, Chanwoong KIM (Republic of Korea)*

- Volcanic Activity And River Network

  *Ekaterina LEBEDEVA (Russian Federation)*



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## POSTER EXHIBITION

- Digitizing and Updating of Applied Geomorphological Map of Western Anatolia and Thrace Using Geographical Information Systems

  *Ahmet ERTEK, Hasan OZDEMIR, Belgin SOL, Emre ELBASI (Turkey)*

- Digital elevation model SRTM as a source of data for geomorphological zoning

  *G.V. LOBANOV, A.V. POLYAKOVA, A.Yu ZVEREVA, B.V.TRISKIN (Russian Federation)*

- Geomorphology and archaeology: mapping landforms around archaeological sites in Kayseri region using high-definition data

  *Y.S. HAYAKAWA, H. OBANAWA, H. YOSHIDA, R. NARUHASHI, K. OKUMURA, M. ZAIKI (Japan)*

- Water Logging In Siwa Oasis Western Desert , Egypt

  *Haitham Shawki Alsayed ALY (Egypt)*

- High resolution and frequency measurement of erosion volume of inaccessible sea cliff using Unmanned Aerial Vehicle

  *Hiroyuki OBANAWA, Yuichi S. HAYAKAWA (Japan)*

- Relief and quality of life in cities

  *Sergey KHARCHENKO, Sergey BOLYSOV (Russian Federation)*

- Morphometric GIS-analysis of landforms of Belarus

  *Dzmitry KURLOVICH (Belarus)*

- Biogenic Relief Of Forest Zone In The European Part Of Russia

  *Alexandra DERKACH (Russian Federation)*

- The nature and extent of continental biogenic relief

  *Sergey BOLYSOV, Vladimir NEKHODTSEV (Russian Federation)*

- Geomorphological criteria of recreational potential of the Crimea Black sea coasts

  *Maria ORLOVA, Eugeniy IGNATOV (Russian Federation)*

- Subrelief of towns

  *Sergey BOLYSOV (Russian Federation)*



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# Analysis Correlation Between Actual Landslide and Landforms Genesis in Sub-Watershed Merawu Banjarnegara Regency

*Gerry UTAMA, Suratman WOROSUPROJO (Indonesia)*

Landslide is the one of the disasters that occurred in Indonesia. This study aims to: 1) Identify distiribution of actual landslide that occurred in the sub-watershed Merawu Banjarnegara Regency ; 2) Identify the relationship distiribution of landslide against growing landform genesis. The method used is conducted by field surveys to obtain an inventory of data and types of landslides that occurred later with the use of information contained on secondary data from Rupa Bumi Indonesia Map and Geological Map in extracting some of the information required about geomorphology. The results of the study showed that there is a relationship between the occurrence of landslides and landform development in Sub-watershed Merawu increasing conversion of land use to grow well into the trigger landslides in terms of factors other than rainfall characteristics and levels of slope. This study is needed in reviewing the analysis of land use planning and appropriate in risk reduction against landslides



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## Assessment of Geomorphological Risk in the Republic of Belarus

*Dzmitry KURLOVICH, Vladislav ROMANENKO (Belarus)*

In the present study an assessment of geomorphological risk in the Republic of Belarus has been made. Geomorphological districts (according to geomorphological zoning) were the objects of the research. Initial spatial data (mainly as rasters), represented such hazardous geomorphological processes as seismic, plicative and disjunctive tectonic, gravity, deluvial, proluvial, alluvial, karst-suffosion, aeolian and technogenic, was integrated into geographic information system (GIS) ArcGIS 10. Then it has been georeferenced and digitized. Some raster and vector GIS analysis was being made and finally quantitative data for each district was obtained. The geomorphological risk assessment was made with help of cluster analysis. The resultant degree of geomorphological risk was got for each district by summarizing the normalized values of all the ten factors. The geomorphological districts were grouped (by method of natural borders) in five classes of risk. For each district the leading, accompanying and minor dangerous geomorphological processes were defined. In consequence of the assessment some recommendations for the rational nature management were developed.



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**Complex assessment of geomorphological safety of Russia**

Ekaterina *EREMENKO,* Andrey *BREDIKHIN,* Sergey *BOLYSOV (Russian Federation)*

Providing of the environmental safety and protection of the population and economy from natural and human induced threats are important priorities of present-day development of Russian society. Risk-free and frictionless functioning of natural and technogenic systems in Russia requires strategic planning of environmental management. Comprehensive analysis has to be based on the results of a complex assessment of natural risks (including, geomorphological risks) or on a complex assessment of territorial sustainability for different types of economic activity. Type and intensity of landform morphology transformation within particular area determine total stability of geomorphological systems both in natural, and in the broken state, and finally – degree of geomorphological safety of the territory. For an assessment of geomorphological safety a complex index is developed, aggregating multiple indicators of landform morphology, natural and technogenic conditions of the territory. These indicators are presented in points and ranged using a number of coefficients according to their importance for a certain type of environmental management. Proposed complex index allows to carry out global, regional or local estimation of geomorphological safety of the chosen region for a certain type of land-use, using in each case particular set of indicators. The increase of an assessment scale is followed by strengthening of its specialization, while global assessments, as a rule, reveal general variability and can be used for economic planning and environmental management. Proposed small-scale map of geomorphological safety of Russian federation allows to estimate regional variability of the developed complex index and can be used for further profound analysis at the local level.



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## The Adaption Of Urban Land Use To The Coastal Change Of West Taiwan

*Jiun-Chuan LIN, Chia-Hung JEN, Yeuan-Chang CHENG, Chi-Jen YANG (Taiwan)*

This paper demonstrates the coastal change and the adaption of urban land use at western Taiwan. The study area is the coastal area of Taichung and Tainan city. Both sites are coastal plain and full with sediments from the upper catchments. The coast line is also dynamic and vulnerable to Typhoon. However there are two types of land use according to the government's policy in the last 30 years. This study tries to find out the impact of artificial engineering to the coastal land use and also tries to find the way of adaption of the coastal change caused by the dramatic climate change. From archive maps and satellite images an evolutional model of coastal change was proposed. There are different ways of development on land use during the last 100 years. The Taichung site has been changed into harbor and artificial tidal plan for industry purpose. However the Tainan area is mainly still used for fish farm and aqua industry and was turned into a national park in 2009. As a result, there are different development models for local economics. This study explains how the coastal line of the study area changed dramatically and the adaption of coastal hazards caused by the typhoon, tropical cyclones in both sites. It is also found that a kind of buffer zone to adapt with coastal erosion for coastal land use as well as to the local society is essential. This paper is trying to demonstrate such a finding. Key words: coastal erosion, coastal land use, climate change, adaptation, coastal change



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## Estimation Of Population At Risk In Korean Coastal Area Using Dasymetric Mapping

*Chanwoo JIN, Jongseo YIM, Chanwoong KIM (Republic of Korea)*

Coastal area has been important as high-density regions of socioeconomic activities. It is expected, however, that the sea level rise due to climate change will increase the risk of coastal areas. Therefore, understanding the status of the coastal area is crucial to ensure sustainability and reduce the damage caused by sea level rise. Although population living in coastal area is essential factor to understand and analyze the characteristics of the coastal area, population aggregated by administrative unit hinders precise analysis. To estimate population of coastal areas, dasymetric mapping, which is the most precise method of areal interpolation, is used. The high-accuracy of dasymetic mapping comes from two factors – accuracy of ancillary data and estimating method –, so we tested binary method and 3-class method with cadastral map and land use map for better performance. As a result, binary method with cadastral map shows the best outcomes, which estimated coastal population is 5.5 million and a quarter of them dwell in Busan. Then, we estimated population at risk and inundation area assuming four scenarios of sea-level rise; 38cm, 59cm, 75cm, and 100cm. According to IPCC 4th Assessment Report (2007), global average median of rising sea-level is 38cm, global average upper limit is 59cm and standard rising value of surface is 100cm. Also 75cm is reflected korean surface rising rate. At the maximum case, population at risk is approximately 0.1 million, which is nearly 2% of total coastal inhabitants.



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## Volcanic Activity And River Network

*Ekaterina LEBEDEVA (Russian Federation)*

Volcanic regions are characterized by seismic activity, visual shifts of land surface, which rapidly change the territory relief. In the mountains the main consequences of this activity relate to the pyroclastic material eruption, lava outflows, lahars, debris avalanches et al. Lava flows cause the large river beds diversions or entirely fill up the low-rate water flow valley. The new channel often goes along one of the valley's sides or the flow can go under the lava surface. Particularly, the water flow often uses the inner lava spaces, the so-called lava tubes. Lava flows block valleys, and lava-dam lakes form. In case of destruction of lava dam such lakes may abolish, while waterfalls may occur instead of the dam. The river valleys formation is impressively dependant on volcanic mudflows – lahars. Periodic lahar flows cause a lot of changes: river bed location in the valley, river thalweg slope, the alluvium mechanical composition; forming of local terraces, accumulation of large amount of loose sediments in the bottom; inter-valleys river transformations. Hot pyroclastic flows with extension up to several decades of kilometers, go down along river valleys on the slopes of many volcanoes. Debris avalanches may also cause significant influence: not only valley structure can change, but inter-valleys transformations of the river network can occur. Volcanic activity can also expand on interstream areas. In consequence of filling up of entire river valleys by lava and pyroclastic material overdeposition of valleys can happen. Formation of calderas and subsiding volcanic depression is typical for the territories of volcanic activity; powerful eruptions cause formation of expanded splits, which also leads to the change of hydrographic network pattern.



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# Digitizing and Updating of Applied Geomorphological Map of Western Anatolia and Thrace Using Geographical Information Systems

*Ahmet ERTEK, Hasan OZDEMIR, Belgin SOL, Emre ELBASI (Turkey)*

Throughout the Turkey, although there are many studies in relation to earth sciences, there are some deficiencies in terms of geomorphology and applied geomorphology. Applied Geomorphological Map of Turkey, which began in 1984 and 1989 as a TUBITAK (The Scientific and Technological Research Council of Turkey) projects, was completed until 31o west longitude in Turkey by Erinç et al. 1984 and 1989. The existing data of the projects completed approximately 30 years ago is still as an analog data and the achievement of them is limited. With this study, the current and existing studies of Applied Geomorphological Maps of Western Turkey and Thrace transferred to digital environment using Geographical Information System (GIS). 1:500.000 and 1: 250.000 base maps used in the study and visualisation of the map increased using hillshade of the topography together with the existing and updated morphological units. Thus, the transferred data to GIS will increase the accessibility of the data and also will be an introduction for Applied Geomorphological Maps of Turkey. Keywords: Geomorphology, Applied geomorphology, West Anatolia, Thrace, GIS, Turkey.



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## Digital elevation model SRTM as a source of data for geomorphological zoning

*G.V. LOBANOV, A.V. POLYAKOVA, A.Yu ZVEREVA, B.V.TRISKIN (Russian Federation)*

Using a digital model SRTM as an information source about the relief determines the relevance of the estimation accuracy of the transfer of morphometric and morphological characteristics of the surface. The least studied performance in SRTM morphological features, the "image" of relief. Homogeneous areas defined by automatic or visual analysis of SRTM data, can defined as the geomorphic zonation units Geomorphological zoning by SRTM data performed for the upper Dnieper catchment - polygenetic plains area of about 130 km2 with prevailing heights of interfluve 150-200 m, a small slope, low vertical differentiation, variety of geological structure. By visual analysis of the digital model of surface gradients allocated 40 morphologically homogeneous areas (districts). Districts identified by differences in the image texture. District areas in the vast majority of cases due to the intensity of tectonic movements, Geology, relief development history. Zoning Objectivity confirmed by the peculiarities of the structure and dynamics of the relief, which cannot obtained from the model directly, in particular, of the longitudinal rivers profile slope. The profile slope values more than 1 m/km correspond to small isolated areas of steep slopes in SRTM; less than 0.2 m/km to large, relatively homogeneous spaces where dominated slopes of low or moderate steepness. The first sections are narrow upland watershed surfaces dissected by the rivers headwaters; the second section are extensive alluvial and fluvioglacial plains in the lower and middle reaches of the main rivers. Compliance areas to relief macro forms determines the relevance of the development approach, for cross-border territories, especially when the terrain analysis using different methods of geomorphological zoning.



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## Geomorphology and archaeology: mapping landforms around archaeological sites in Kayseri region using high-definition data

*Y.S. HAYAKAWA, H. OBANAWA, H. YOSHIDA, R. NARUHASHI, K. OKUMURA, M. ZAIKI (Japan)*

Human activities in ancient periods were largely affected by physical environments including landforms. Geomorphology of archaeological sites and surrounding areas is therefore essential for the understanding of cultural developments in such time periods. However, topographic maps in remote areas are often unavailable for geomorphological surveys. The necessity of topographic mapping as the first step of the field surveys is becoming fulfilled with recent technologies of high-definition data acquisition such as laser measurement and photogrammetry. Here we apply the methodology of laser measurement, SfM-MVS (structure-from-motion multi-view stereo) photogrammetry and GNSS (global navigation satellite system) for detailed, high-definition topographic mapping of characteristic landforms around archaeological settlements (mainly B.C. 3000 – A.D. 1000) in Kayseri region, central Turkey. The landforms include alluvial fans, fault scarps and hummocks in debris avalanche deposits. The resultant data, including DEM (digital elevation model) and orthorectified photographs, have resolutions on the order of meters to centimeters, allowing detailed reading and analysis of the land surface structures and geomorphological mapping. The data will be further analyzed to clarify spatiotemporal relationships of archaeological settlements and landforms.



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**Water Logging In Siwa Oasis Western Desert , Egypt**

*Haitham Shawki Alsayed ALY (Egypt)*

WaterLogging In Siwa Oasis Western Desert,Egypt Haitham Shawki Alsayed Aly Department of Geography, Faculty of Arts , Ain Shams University , Cairo , Egypt gis4arab@hotmail.com Abstract Siwa Oasis is an isolated environment, located in the Northwest of Egypt, about 300 KM from Mediterranean coast and about 450km from Nile Valley with a very distinctive geographic characteristics Waterlogging in Siwa Oasis is one of the most serious impediments to agricultural activities, where ponds and marshes expand to cover margins of the cultivated lands reducing the production of land ,ponds expanded from being 26km2 in 1987 to be 70km2 in 2009, as a result to agricultural land expansion and inefficient irrigation and drainage networks, especially since 1985, waterlogging affect the state of the buildings, roads and agricultural as well. Remote sensing techniques integrated with geographic information systems, Erdas Imagine software and ArcGIS, were used for the analysis of images and change detection using multi temporal Landsat images , Arc GIS was used to draw features and carry on measurements using different scale topographic maps . This study will discuss the problem , extension , causes and its impact. Key words : Siwa Oasis , Egypt , Waterlogging , Western Desert ,Landsat , Nile Valley , Environmental Problems .



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# High resolution and frequency measurement of erosion volume of inaccessible sea cliff using Unmanned Aerial Vehicle

*Hiroyuki OBANAWA, Yuichi S. HAYAKAWA (Japan)*

Recently aerial photography with small UAV (Unmanned Aerial Vehicle) carrying a compact camera and SfM (Structure from Motion) technique is carried out by many researchers. As one of the advantages of the small-quadcopter survey it can closely shoot and measure the steep slope including overhanging where the existing manned airplane cannot survey enough because its flight height is relatively high and so it cannot come close to the object. In addition, because running cost of the small UAV survey is far less and its operation is relatively easy, repetitive measurements are easier than the existing methods such as aerial photogrammetry and laser scanning with manned flight. We have carried out the topographic measurements using the above advantages at overhanging slope of sea cliff in Chiba Prefecture (Japan) where nobody can reach because it is surrounded by the sea. By the repetitive UAV measurements we have constructed the multitemporal 3D models of the sea cliff and could quantitatively clarified the topographic change with higher spatial and temporal resolutions. The UAV-SfM technique has a great potential for a wide range of application, because of its high data accuracy, low acquisition and operational costs, allowing high spatial and temporal data recording.



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## Relief and quality of life in cities

*Sergey KHARCHENKO, Sergey BOLYSOV (Russian Federation)*

Relief controls the course of some atmospheric, hydrospheric, technical and engineering processes in cities. Thus relief has influences on urban life quality. We studied this effect on a quality of life by some sides of urban environment — sunshine duration in residential zones, wind field in urban sites with complex terrain, noise propagation from roads in relation with the terrain profile. Moreover, landform's pattern is prerequisite or obstacle to organization of effective ecological framework, drainage system and other. At last, geomorphologic hazards has important effect on quality of life. Our research is based on the different data types: field data from works in several cities of European Russia; published data of geomorphological and ecological researches in Russian and foreign cities; poly-scale topographical information; building and urban zoning information open sources; urban climate data. Quantitative estimation of geomorphologic effect on the some sides of urban environment shows that this effect is expressed by values around 5-30% from nominal (project) values of appropriate physical values. In the cities of hilly plains (for example, Kursk, Voronezh) in mid-latitudes the duration of sunshine have deviations between project and real values on 5-10%. The simulation of wind flow in city canyons with terrain base and without it shows that wind speed can differ by the value 30%. The noise propagation from highways over hilly and anthropogenic created terrains has a less effectiveness than noise propagation over flat or scyphiform terrains on values before 20 dB(A) on length of 20 m from road. The definition of the «geomorphological comfortability» is offered.
The study partially was supported by RFBR, research project №14-05-31010мол_а.



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## Morphometric GIS-analysis of landforms of Belarus

*Dzmitry KURLOVICH (Belarus)*

An original method of morphometric GIS-analysis of landforms in the Republic of Belarus was elaborated. As a result of the research main morphometric parameters (slopes, slope aspects, vertical, horizontal and general indicator of ruggednesses) were derived by SRTM DEM using the standard tools and elaborated by the author geoinformation models in GIS ArcGIS 9.3. The new map of morphometric zoning was created. According to this map the territory of the Republic of Belarus is subdivided into 5 regions and 60 areas. The results of the study are recommended for use in agriculture, land management, soil science, in construction of buildings, infrastructure objects and land reclamation networks.



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**Biogenic Relief Of Forest Zone In The European Part Of Russia**

*Alexandra DERKACH (Russian Federation)*

There are two main genetic complexes of biogenic mezo-, micro- and nanorelief at forest zone of the European part of Russia – zoogenic and phytogenic. Each of these complexes subdi-vide into accumulative and denudation. Accumulative forms are result of organism-constructor and organism-depositor's activity, organism-destructors create denudation biogenic relief. Bio-genic factor plays an important role in relief-formation in the forest zone. Biogenic is basic geo-morphological process at many places such as swamp areas, beaver complexes and subhorizontal surfaces of interfluves and different terraces – river, sea, lake. Also organisms exert strong influ-ence on relief in balkas and gullies. Indirect effect of biota influences intensity of abiogenic ge-omorphological processes at forest zone of European part of Russia. Contribution of biogenic processes to relief-formation is quantitatively comparable with contribution of another geomor-phological processes and sometimes exceed it. Average density of biogenic forms at forest zone get from several tens to one hundred forms per ha, maximum – thousand forms per ha in gullies and tens thousand forms per ha at swamp areas.



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## The nature and extent of continental biogenic relief

*Sergey BOLYSOV, Vladimir NEKHODTSEV (Russian Federation)*

Until recently, the role and scale of the impact of biogenic factor on continental relief was clearly underestimated. In fact, the influence of biota on the topography of the land is extremely powerful. The evolution of the biota within about 3.5 billion years has created enormous amounts of organogenic rocks - not less than 15% of the mass of stratisphere, and taking into account the photosynthetic oxygen - up to 70%. Currently, the land is almost ubiquitous biogenic forms from nanoform to microform. Their density ranges from tens to hundreds, rarely up to tens of thousands of units per hectare. Biogenic bulge forming is a leading geomorphological process, at least 15% of the land area. In addition, the biota has a powerful indirect effects on terrain, changing the nature and intensity of abiogenic processes 1-3, until they block or initiation. At the local level organisms actively shape and transform the microrelief of the earth's surface. At the regional level biota contributes to the enrichment of the substance of natural areas with rich vegetation, with denudation of the continents in treeless areas 4-5 times more intense than in the forest. At the global level, thanks to the biota of 12-15% is pay part of the balance of substances in the coastal zone of the ocean in the process of biological runoff from the continents. On the planetary level of biogenic factor is the main and possibly unique, providing enrichment mass of the earth's crust of solid substance in the Phanerozoic. Among the main geological-geochemical and ecological functions of living matter there is one - geomorphological. Historical climate the concept of nutrient relief on land may be expressed by the following logical scheme: "the evolution of the biota and nutrient relief - zoning biogenic relief (including biomass, biodiversity and behavioral characteristics of the biota) - specificity and extent of nutrient impacts on landforms in different natural zones».



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**Geomorphological criteria of recreational potential of the Crimea Black sea coasts**

*Maria ORLOVA, Eugeniy IGNATOV (Russian Federation)*

General geophraphic or economic approach is often used as an object for exploration the coastal zone. Accordingly to this study – geomorphologic approach, which allows to estimate impact not only on the landscape in general, but also on its primary component – relief. Crimea is characterized by unique variety of reliefs and coast types. Coast line of Crimean peninsula is characterized by high anthropogenic pressure and acute geonecological problems. System approach helps to reach optimal solution, which allows to follow spatial limits of influence of one or another natural process or aspect of anthropogenic impact. Such approach is described in this proposed work.



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## Subrelief of towns

*Sergey BOLYSOV (Russian Federation)*

Currently, urbanization has become a global process, the rate and extent of which are dramatically increasing. The most important resource in this regard is the underground cities, which is very actively developed in parallel with the above-ground area. This raises new problems, largely due to the intensification of geomorphological processes in the subsurface strata, and still there is frankly little geomorphological studies of the systemic nature in underground cavities. So, the history of active development of underground space in Moscow has at least 150 years, but attempts to systematize simultaneously geological, historical, geomorphological, biological data appear only in the beginning of the 21st century, although in the 1960s, the work of F. C. Kotlova generalize knowledge about karst cavities. The authors of dungeons natural underground cavities and forms was proposed the term "subrelief" (Astrakhan, 2011). We can distinguish 3 types - natural, anthropogenic and natural-anthropogenic. In Moscow subrelief presents forms of karst and suffosion, biogenic and anthropogenic systems, and specific anthropogenic fluvial forms (created by watercourses, prisoners in the reservoir). The underground rivers in the sewers there are many traits and conventional above-ground rivers (the meandering, the formation of riverine flats, terraces, marzioni boilers and others), but there is considerable specificity (sharp rises in level and manpower with effects similar to debris flows).If the depth of biogenic forms does not exceed a few meters, then anthropogenic development in Moscow is at least 180 metres, meeting almost everywhere. Communication is about several tens of kilometers of underground rivers, over 150, the length of underground lines exceeded 350 kilometers. In addition, the city has several areas with active karst (about 15% of the city area) and anthropogenically activated by sufosia. All the processes taking place beneath the earth, it is extremely risky and fleeting. The active dynamics of the underground space of the city does not allow you to keep track of all its objects for preventive measures, so every year there are dozens of failures, failures in communications. Load technosphere on dungeons enormous and requires the detailed study.



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# C12.01 Applied Geography

# C12.28 Local and Regional Development

## Applied local and regional development: 1 Case Studies of Sustainable Development

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- Change in the pattern of community economy: Case study Nong Meg Village Moo 3, Non Somboon Sub-district Ban Had District Khon Kaen Province

  *Bodee PUTSYAINUNT (Thailand)*

- Regional Disparities In The Economical Development Of China

  *Elena SAMBUROVA, Ksenia MIRONENKO (Russian Federation)*

- The economic crisis and the internal geographical mobility patterns of the immigrant population in Portugal

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- Geoexpertology –New Direction of Modern Geography

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- A Geospatial Analysis of Multi-scalar Regional Inequality in China

  *Hui LIN, Sanwei HE (China (Hong Kong))*



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- The Role of Real Estate Agencies in Building and Construction Development Using Topsis Method

  *Farahnaz AKBAROGHLI, Leili NIKOO (Iran)*

- Renewable energy sources for sustainable development in Sub-Saharan Africa: status, prospects and risks

  *Liudmila NEFEDOVA, Alexander SOLOVIEV, Mikhail IVANOV (Russian Federation)*

- Livelihoods and Rural Poverty Reduction in Southwest China

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- Modeling of the socio-economic regional situations in the national economic system of the Russian Federation

  *Anastasia MYADZELETS (Russian Federation)*



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**Change in the pattern of community economy: Case study Nong Meg Village Moo 3, Non Somboon Sub-district Ban Had District Khon Kaen Province**

*Bodee PUTSYAINUNT (Thailand)*

The purpose of this study was to understand the general context of Nong Meg village including the pattern of community change in the village. The study employed the concept of community economy. In-depth interviews were applied through guided questions, with 24 key informants and also included 95 household representatives. The study found that since 1894, the previous pattern of community economy in Nong Meg village was agriculture, based on rice cultivation and hemp grown for their own consumption and for sale. In 1955, when the Ban Had railway station was constructed, some villagers were employed by the railway construction company. This event caused a change to their community economy which became mixed between agriculture and temporary non-agriculture. In 1978, serious flooding in Ban Had district led village labourers to seek work in Bangkok which changed the pattern of the community economy to become agriculture and full-time non-agriculture. In 1980 the use of new technology by farmers in the village changed the mode of agriculture to become focused on production and the pattern of the community economy to become modern agriculture and full-time non-agriculture. At the present time, due to improved community infrastructure and education, the new generation of labourers have led the pattern of community economy to become more non-agricultural. However, the pattern of community economy in Nong Meg village has adapted to suit the context of the community. This has ensured maintenance of the community economy pattern, under the steam of capitalism.



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## Regional Disparities In The Economical Development Of China

*Elena SAMBUROVA, Ksenia MIRONENKO (Russian Federation)*

China is a large country which always had regional disparities in the economic development. Traditionally there were interior and coastal regions in China. When People's Republic of China (PRC) was founded the government was paying more attention to the development of interior region for the security of the country. When reforms started in 1978 regional policy had been changed: coastal region started rapid growth and became "the locomotive" of Chinese economy. In 1980-90th regional development was based on 3 regions: East-Central-Western; regional disparities were growing up. At the end of 1990th PRC leaders needed new system of regional division to reduce the disparities. Regional programs became the most important tool of regional policy of PRC in 21 century. PRC was divided into 4 regions: East, Central, Western, North-Eastern. Nowadays there are special programs for each region: there are preferences for Western region, renovation of the old industrial zone on North-Eastern region, intensive industrialization on Central region. Disparities are caused by internal factors (different conditions of region at the beginning of development; different population density; different capacity on demand; different structure of regional economy; difference of government investment; different development of infrastructure, access to Internet facilities) and external factors (international trade, foreign investment, system of "open up" territories). Difference of internal and external factors of economic development deepen or smooth regional disparities of Chinese region. Nowadays the trend of reducing degree of regional disparities is the result of financial and economic crisis, regional policy of the PRC leaders and the growth of labor costs in the coastal provinces of China.



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# The economic crisis and the internal geographical mobility patterns of the immigrant population in Portugal

*Maria Lucinda FONSECA, Diogo de ABREU, Alina ESTEVES (Portugal)*

During the most recent decades, international migration has had a growingly relevant role in Portugal's the demographic dynamic and also of the Portuguese regions. From a traditional emigration country, in the 1990s and early 2000s, Portugal, like other Southern European countries, experienced a significant change in its immigration flows, which not only increased substantially, but also diversified in terms of origins and Portuguese regions of destination. After 2009, with the deepening of an economic crisis that gave its first signs in 2004 and worsened with the policy of extreme austerity that was implemented after 2010, migrants' inflows declined substantially and a significant number of Brazilians, Ukrainians and others returned to their countries or re-emigrated to new destinations. Additionally, unemployment rose significantly among the foreign groups (firstly, at a faster pace than among nationals) and reports of hardship in daily life conditions have multiplied. In addition, the worsening of the national economy and the increasing unemployment led several thousand Portuguese citizens, mostly young, to emigrate. Therefore, since 2010 emigration has been higher than immigration and thus, the migratory flows are reinforcing the already negative natural population loss. This paper explores the repercussion of the change in the economic cycle on the internal geographical mobility patterns of the immigrant population in Portugal. The analysis is based on 2011 census data and aims to describe and explain the changes in residential mobility and internal migration patterns according to nationality adopting a comparative perspective with the native population.



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## Typology of Russian regions for the economic policy purposes

*Alla SOROKINA, Pavel PAVLOV, Zemtsov STEPAN (Russian Federation)*

Russia consists of 83 regions which are called subjects of Federation. They are very different in terms of political status, national autonomies, availability of resources, climatic conditions, distance from borders and the capital, size and population density. GDP per capita differs in Russian 20 times, but this difference had a tendency to decrease after 2005 year. Our article presents the typology of Russian regions based on aggregate classifications. The aim of typology is to identify regions with similar characteristics and promote their collaboration and implementation of similar policy measures. Regional typology is also beneficial for making comparisons between regions and to conduct benchmark analysis (Development of a regional typology – Aim, methods and results, 2010). In previous studies, conducted in the early 2000, Russian regions were aggregated in 7 groups - "Producers and consumers", "Oil exporters and consumers", "Pour consumers", "Rich investors", "Pour investors", "Transitional", "Depressive" (Buts et al., 2002). The economic conditions during the period of more than 10 years significantly changed in Russia and now the composition of groups of regions and their number have changed significantly. Government regional redistribution policy and increased level of complexity in Russian economy resulted in the increasing number of groups of regions. Authors of the article use cluster analysis techniques (Ward's method) for identifying groups of regions according to their living standards, investment attractiveness, economic potential, institutional environment, and innovative development. Authors also build a compositional classification of regions based on their resilience to crises. In the article authors also test the hypothesis about convergence of Russian regions. Domestic authors (Drobishevsky, 2005; Sorokina, 2011) showed that there was an absolute convergence among Russian regions during 1994-2002 and 2000-2008 years. In the article authors also investigate how did financial and economic crisis of 2008-2009 affect the convergence of Russian regions.



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**Industrial Spatial Agglomeration Using a Distance-based Approach in Beijing Metropolitan Area**

*Wenzhong ZHANG, Jianhui YU, Jiaming LI (China)*

This article is to test the spatial agglomeration across industries and firm sizes at the city level. Our research bases on a unique plant-level data set of Beijing and employs a distance-based approach, which considers space as continuous. Different from previous studies, we set two sets of references for service and manufacturing industries respectively to adapt to the investigation in the intra-urban area. Comparing among eight types of industries and different firm sizes, we find that: (1) producer service, high-tech industries and labor-intensive manufacturing industries are more likely to cluster, whereas personal service and capital-intensive industries tend to be randomly dispersed in Beijing metropolitan area; (2) the spillover of the co-location of firms is more important to knowledge-intensive industries and has more significant impact on their allocation than business-oriented services in the intra-urban area; (3) the spatial agglomeration of service industries are driven by larger establishments, whereas manufacturing industries are mixed.



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**Evolution Of The Urban System: The Case Of The Moscow – St Petersburg Transport Corridor**

*Andrey MURASHOV (Russian Federation)*

Integrating a spatial dimension to conventional trend analysis we reproduced reasonably the hierarchical pattern of the Moscow – St Petersburg transport corridor's urban system during the period from 1897 to 2010. In particular we employed spatial econometric methods to search for the existence of distance spatial effects. The analysis showed a rather systematic spatial pattern. The urban system is organized strongly in a center-periphery pattern, starting from a core located in Moscow and St Petersburg diffusing to a central part of the corridor. The vast territories of Novgorod and Tver' regions lie in the agglomeration shadow of the two cores. We showed this leads to results the non-linear core-periphery model predicts (Fujita, Krugman, Venables, 2001). We found a general trend towards a higher concentration of activity in the urban system; however, the trend is not a continuous one but has several stages in pace of population growth. The periphery suffered a severe setback in terms of urban population decline and economic performance versus capitals over the last two decades, so the regions of the corridor are currently far away from the decentralization phase. Novgorod and Tver' regions are indeed a very special case - they are literally constricted between the two largest metropolitan areas of Eastern Europe. We analyze the mechanism of their setback and reasons for it. We conclude that both regions failed to occupy an efficient economic niche in relationship with capitals. Our final aim is to propose how the periphery can resist cores' strong influence and reanimate its economy by seizing opportunities closeness to the cores provides.



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# Geoexpertology –New Direction of Modern Geography

*Ekaterina POZACHENYUK (Russian Federation)*

Geoexpertology is a new interdisciplinary direction of geography studying theory and methods of expert evaluation of natural study orientation (analogy - historical geography, medical geography, recreational geography). Geoexpertology is based on a system-synergetic world view, theory (integration of expertology, general ecology and geography). Object is present-day landscapes. Subject is interdisciplinary assessment of environmental management and functioning of present-day landscapes related with it. Form of implementation: scientific and practical view of expert activity - environmental impact assessment, environmental audit. The subject matter of the expert method of research is the analysis of the three types of factors that determine the functioning of present-day landscapes: deterministic, stochastic and indeterminate. Expert problem is formulated: for given values of determined factors A1, .., Ai …, Ap, stochastic factors with known distribution B1, …, Bi …, Bn, and taking into account uncertain factors X1, … Xi…, Xk, find the optimal value of У1.., Уі.., Уm from the field of Qy1.., Qyj.., Qym. The typification of geoenvironmental expertise was developed depending on: performed function - monofunctional (regulatory controlling, diagnostician, evaluation, forecasting, conflicting); polyfunctional (variants of monofunctional expertise synthesis); form of territorial organization (river basin, administrative territory, region etc); the size of an object, and others. The method of geo-environmental assessments is developed; the key point of it is a qualitative or quantitative evaluation of coadaptation of economic subsystem with a natural one.



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## Specifics of Cluster Policy in Russia

*Alla SOROKINA, Pavel PAVLOV, Stepan ZEMTSOV (Russian Federation)*

Our article presents the specifics of cluster support policy in Russia and the analysis of results of a detailed survey of quality management in Russian clusters. The Government in its attempt to foster development of innovations and commercialization of technologies in Russia decided to support «innovative territorial clusters». In the beginning of 2012 Ministry of Economic Development of Russia initiated a competition of regional cluster projects. Russian regional administrations submitted about 100 applications and among them 25 were selected for support from the federal budget. At the beginning of the program clusters could spend federal subsidies mainly on improving infrastructure in territories of their location. The clusters are situated in more than 20 Russian regions, and in future should highly affect the regional development processes. Selection process was aimed at choosing high-tech clusters with high innovative potential. These enterprises operate in such spheres as biotechnology, aerospace industry, nuclear power medicine, informational technologies. The main problem of these clusters is that they lack a tie of small companies and are not highly integrated in regional networks. Ministry of economic development is now addressing this shortcoming by organisation of special centers for cluster management that will provide soft infrastructure services - facilitation of interactions between cluster participants, provision educational services, etc. In conclusion of the article we identify the strong sides and areas of improvement for Russian cluster policy, especially for regional application. This analysis will be useful for researchers and politicians from regions where cluster policy became a mechanism of development.



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# The Role of Real Estate Agencies in Building and Construction Development Using Topsis Method

*Farahnaz AKBAROGHLI, Leili NIKOO (Iran)*

Housing has always been a fundamental issue in governments' authorities and responsibilities contest, it has provoked numerous positive and negative economical dynamics, as among country's economic sectors, it has devoted most of private sector contribution to itself. During the past years, housing price has experienced many fluctuations. There has not been any price regulatory authority in marketplace; therefore, it caused a devastating trade process in a continuous and increasing way, and various people including dealers, constructors, and/or property owners decide on pricing in this important section.The purpose of this study was to evaluate the role of real estate agencies in urban building and construction development. Statistical population consists of real estate agencies in district 9 of Mashhad municipality, and based on Cochran's formula, 163 samples were selected. Documentary and field research methods are chosen for this study. To evaluate the role of real estate agencies in district 9 of Mashhad using Delphi method, 10 questionnaires is completed and expertly information is collected. Topsis modeling method showed that the positive role of real estate agencies in body development, land speculation, building and construction and pricing has been more effective than their negative role. Hence, it is advisable to consider reducing the number of these agencies and increasing government supervision in this context.



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# Renewable energy sources for sustainable development in Sub-Saharan Africa: status, prospects and risks

*Liudmila NEFEDOVA, Alexander SOLOVIEV, Mikhail IVANOV (Russian Federation)*

The development and strengthening of the concept of sustainable development contributes to the increase of renewable energy (RE) sources role in the global energy sector. In African countries with high potential resources of renewable energy, development of renewable energy resources is an important factor of social and economic development of these countries, increase of energy and economic independence, as well as a lever to overcome the spatial heterogeneity of the population's access to electricity, improve ecological conditions and fight against deforestation. The report reviews renewable energy resources and the plans of Sub-Saharan Africa Countries for their development, as well as the support of international environmental and financial organizations for renewable energy development in this region. The 2012 UN Initiative "Sustainable Energy for All" and the Initiative of 19 countries of East and South Africa at the IREDA Assembly in Abu Dhabi in 2014 of "Africa Clean Energy Corridor" are considered. The typology of Sub-Saharan countries is performed based on the analysis of the status and government plans for RE development. A detailed analysis of the current state and future plans for the development of RE sources in the two largest countries of East Africa - Kenya and Ethiopia is presented. The renewable energy development in the region is associated with high investment risks and requires international financial and technical support. Risk factors include: significant geospatial and temporal variability of wind and solar energy, high costs of exploratory drilling for geothermal resources with a probability of negative results, instability of political regimes and corruption, lack of qualified staff, technical illiteracy of a country's population.



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**Livelihoods and Rural Poverty Reduction in Southwest China**

*Kerong SHENG (China)*

Poverty reduction efforts in southwest China are mainly based on the twin strategies of the Outline for Development-oriented Poverty Reduction for China's Rural Areas (2011-2020) and the Large-scale Development of Western China. This paper, loosely based on sustainable rural livelihoods framework, uses household-level field survey data in two China's southwest mountainous regions, Zhaotong and Nujiang prefectures, to derive policy inference relevant to the capacity to achieve its purpose for rural poverty reduction. Research findings show that special crops, livestock breeding, self-employment nonfarm activities and migration remittances constitute the main sources of household income. Rural households confront multiple severe constraints, and rural poverty is strongly associated with adverse natural conditions, lack of land and livestock, poor transport conditions and high transaction costs, low level monetized rural activities, low quality of labor force, and lack of modern production factors. Earthquakes and other natural disasters cause negative impact on rural livelihoods, and hydropower building and Grain for Green Project have also generated adverse impact. In the light of the micro-evidence, the creation of a facilitating environment that encourage the flourishing of monetized rural activities merits integrating more definitely into macro-level rural poverty reduction thinking. The policy maker should pay more attention to the improved transport infrastructure and high quality seed, land improvement, specialized farmers cooperatives and fair market environment, accessibility of microfinance for small business, human resources development and diversified income generating activities. And because of eco-overload population, migration and offsite urbanization are also important measures to reduce regional poverty. On the other hand, regional policy should also be improved to construct a new relationship of mutual benefit between the coastal and the southwest mountainous regions. This includes establishing long-term ecological compensation mechanism for farmer engaged in Green for Grain Projects, increasing the proportion of local taxes retained of mountain mineral resources, hydropower and other renewable energy development.



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**Modeling of the socio-economic regional situations in the national economic system of the Russian Federation**

*Anastasia MYADZELETS (Russian Federation)*

This paper is concerned with the methods of mathematical modeling of the socio-economic situation of regions and its changing. The objective of this study is to analyze the correlation between the individual socio-economic characteristics of the investigated territory. The territory's individual characteristics, in turn, are treated as invariant conditions of its development. The study territory includes regions and federal districts of the Russian Federation. An assessment of the regions' situation changes is made from the perspective of analyzing their current socio-economic situation for the time interval 1999-2012 taken from official statistical handbooks. To accomplish this, a special-purpose mathematical model is developed in the form of a hierarchical indicative function relating the generalized indicator characterizing the development potential (the "indicated") to the particular socio-economic characteristics of the territory (the development indicators of the local economy) via the model coefficients (regulators). As a result, the economic-mathematical model is generated in the form of an indicative function characterizing the current socio-economic situation of the regions and federal districts of the Russia on different levels of economic organization (from local and regional to national). It reflects appropriately and dramatically the specific character of the region's socio-economic potential by the example of the connection of investments with the volumes of production. The model permits the position of the regions and districts to be identified in the system of inter-regional and national socio-economic links and economic-geographical conditions of development. The results derived from modeling the socio-economic situation of Russia's regions have been used to create the map of the country's socio-economic association characterizing invariant characteristic of regional development and the changes in the current economic conditions.



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# C12.06 Cold Region Environments

# C12.18 Hazard and Risk

## Natural hazards and risks in Arctic and cold regions environment 1

**Chairperson(s):** *Sergey SOKRATOV, Jose NOVOA*

- Natural hazards in Polar regions – a review

  *Sergey SOKRATOV, Alexandr SHNYPARKOV (Russian Federation); K. Peter KOLTERMANN (Germany)*

- Are the risks of drought at the regional level lessened by a potential melting of permafrost in the semiarid Chile Andean?

  *Jose NOVOA (Chile)*

- Glaciers and their impact on human activity

  *Sergey GOVORUSHKO (Russian Federation)*

- Social and environmental significance of snowstorms

  *Sergey GOVORUSHKO (Russian Federation)*

## Natural hazards and risks in Arctic and cold regions environment 2

**Chairperson(s):** *Sergey SOKRATOV, Jose NOVOA*

- Formation of storm surges in the Dvina Bay of the White Sea

  *Victor ARKHIPKIN, S.A. DOBROLYUBOV, Anastasia KORABLINA (Russian Federation)*

- Landslide risk in the Northern Caucasus

  *Alexandr SHNYPARKOV, Vyacheslav BABURIN, S.A. GAVRILOVA, V.V. GRAYZNOVA, A.V. DANILINA, A.V. MARTYNOV (Russian Federation)*

- Recent rockfalls and rock avalanches in the high mountains (case study of the Caucasus)

  *Elena SAVERNYUK (Russian Federation)*

- Assessment of glacial lake outburst flood and debris flow hazard in Northern Afghanistan

  *Sergey CHERNOMORETS, Elena SAVERNYUK, M.D. DOKUKIN, Olga TUTUBALINA, K.S. VISKHADZHIEVA*



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# POSTER EXHIBITION

- Large-scale indicators of extreme rainfall in the coastal natural and economic zones of European RussiaLarge-scale indicators of extreme rainfall in the coastal natural and economic zones of European Russia

  *Tatiana MATVEEVA, Daria GUSHCHINA (Russian Federation)*

- Extremal exogenic processes in Cherek Balkarsky basin in 2009-14

  *Vadim KARAVAEV, A.VOSKOVA, S. BULANOV, S. SEMINOZHENKO (Russian Federation)*

- Extreme wind speeds in the Barents and Kara Seas

  *Larisa SOKOLOVA, Galina SURKOVA, Artjom CHICHJOV (Russian Federation)*

- From accident to accident: changes in the avalanche hazard assessment

  *Ekaterina LOGINOVA, Alla TURCHANINOVA, Yuri SELIVERSTOV, Tatiana GLAZOVSKAYA, Marina VIKULINA (Russian Federation)*

- Environmental effects of de-icing agents in the soils of the Eastern District of Moscow

  *Natalia KOSHELEVA, E.M. NIKIFOROVA (Russian Federation)*

- Channel Processes Hazards - Displays, Frequency, Risks

  *Alexandr ZAVADSKIY, Alexey CHERNOV (Russian Federation)*

- The tendency of hazardous geological processes development on the territory of Russia at the beginning of the XXI century

  *Boris KRESTIN, Irina MALNEVA, Nina KONONOVA (Russian Federation)*



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## Natural hazards in Polar regions – a review

*Sergey SOKRATOV, Alexandr SHNYPARKOV (Russian Federation); K. Peter KOLTERMANN (Germany)*

The increasing activity in Polar regions, especially in Russian Arctic, brings new companies and people in there, not necessarily having experience in economic activity and not aware of the possible difficulties in adaptation to and protection from the Polar-specific hazardous incidents. The experience in dealing with the natural hazards in Polar regions was slowly gathered over hundreds years of mainly Arctic exploitation. However, such experience is not always at the level of the present time industrial development. Practically all the components of the cryosphere, from the atmospheric ice to Aufeis and permafrost affects the specific of the land use in here and require serious attention in any planning activity. The presentation is focused on the review of hazardous processes in Polar regions and the specific of the mitigation measures in there.



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# Are the risks of drought at the regional level lessened by a potential melting of permafrost in the semiarid Chile Andean?

*Jose NOVOA (Chile)*

The problems arising from the current water scarcity have impact on most of the planet. Derived from climate change projections indicate that Chile is no exception to this trend. However, the semi-arid ecosystem shows a trend towards the increase of water resources. One possible answer is related to the potential melting of the Andean permafrost. The methodology is based on the analysis of trend of the natural flows recorded in 29 stations between 1950 and 1990 (40 years of data). Which should show trends to the decrease of the water resource available into the future so that I could correlate positively with the trends of climate change. The results show that the semiarid ecosystem does not behave in a uniform way, but in its greater surface flows tend to increase in periods with low rainfall liquid and solid. Hence appears as a possible hypothesis that this increase could related to the melting of the Andean permafrost, whose behavior is completely unknown at present, and also opens a new line of research to study it at the regional level.



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# Glaciers and their impact on human activity

*Sergey GOVORUSHKO (Russian Federation)*

Glaciers are mobile natural accumulations of atmosphere-produced ice on the Earth surface. Glaciers occur on every continent and in approximately 47 countries. They occupy an area of about 16.2 million square kilometres; that is, 10.9% of the land surface. Glaciers have a direct or indirect effect on people (collapses—one-time falls of considerable ice masses; the indirect effects are mainly related to the formation of glacial lakes, which inevitably break, resulting in catastrophic floods) and many objects and kinds of human activity: (1) residential construction (both catastrophic factors: breaks of glacier-dammed lakes and falls of ice; and slow motion of glaciers when they demolish buildings and other structures); (2) transport (ice falling, breaks of glacier-dammed lakes, and burial under the ice mass); (3) bridges (breaks of glacier-dammed lakes); (4) crop production (breaks of lakes and advance of glaciers; positive effect of glaciers on agriculture is related to their considerable contribution to the nourishment of rivers); (5) livestock farming (advance of glaciers sometimes buries farms and fields); (6) water power engineering (effects may be either negative or positive; negative influence is related to the powerful destructive effect of glacier collapses; in part, the burst waves caused by them are very hazardous for hydraulic structures; positive influence predominates, and it is related, first of all, to the great contribution of glacier meltwater in the nourishment of rivers where hydropower stations have been constructed); and (7) the mineral resource industry (glaciers can block entrance of mines).



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**Social and environmental significance of snowstorms**

*Sergey GOVORUSHKO (Russian Federation)*

Snowstorms affect many kinds of human activity: (1) industrial and civil engineering (reduction in the safety and accessibility of buildings; accumulation of snow on building roofs creates excess loads and, as a result, the collapse of buildings; the sliding of snow from oblique roofs can cause trauma, etc.); (2) grassland farming (dynamic impact of the snow-and-wind stream, visibility deterioration, and sweeping up with snow give rise to mass mortality of animals); (3) crop production (snow redistribution causes a deep winter frost penetration and lack of moisture in snowless places and over-wetting and late thawing where snow accumulates); (4) transport (major influencing factor is snowdrifts, which often slow down traffic and block landing strips; roads on mountain passes and road sections that are in the wind shadow and in topographic lows are snowbound; abrupt visibility deterioration); (5) recreation (blizzards restrict activities during winter holidays; on the other hand, drifting snow results in an increase in the thickness of snow cover on slopes with alpine skiing trails); (6) transmission lines (effects are chiefly related to the dynamic impact of the snow-and-wind stream and deterioration of the electrical insulating properties of air); (7) radio communication (when snowflakes break up, their snow-drifting electrification results in radio interference in the snow-and-wind stream); (8) mineral resource industry (impact is related to complications in the operation of strip mines owing to snow accumulation); and (9) forestry (effect is expressed as mechanical damage to trees, especially conifers).



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## Formation of storm surges in the Dvina Bay of the White Sea

*Victor ARKHIPKIN, S.A. DOBROLYUBOV, Anastasia KORABLINA (Russian Federation)*

Storm surge level rises could lead to flooding of coastal areas of the adjacent land and the destruction of the commercial facilities. Surges in the White Sea are caused mainly by deep cyclones of two types: "diving" (repeatability about 88%) and western. The average size of the storm surge in the White Sea is 0.6 m and up to 0.9 m in the bays. An average duration of surges is about 80 hours. Surges occur most frequently in the mouths of the rivers Mezen, the Northern Dvina, Onega. Formation of storm surge in the Dvina Bay of the White Sea on November 15, 2011 were analyzed using mathematical modeling. The size of the surge reached 2 m in the delta of the Northern Dvina River and 3 m at the distance of order 100 km from the river mouth. We used the model ADCIRC; calculations were made on unstructured grid with variable step from 50 m to 5000 m. The open boundary conditions allowed tidal fluctuations and the river inflow 100 km from the mouth of the Northern Dvina. The model used data reanalysis wind field CFSv2. Numerical experiments identified features of storm surge propagation to the delta and further to the Northern Dvina River. Analysis of the model results showed that an important factor in the formation of this surge was the river backwater. We also found a drop in sea level before surge and false high water ("manikha"). Water penetration from the sea along the left coast of the Northern Dvina River and controversial transport of water to the sea along the right coast were observed. Small differences between simulated surge and the observed one could be explained by rejection of two possible factors: the atmospheric pressure variations and long gravitational waves coming from the Barents Sea.



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# Landslide risk in the Northern Caucasus

*Alexandr SHNYPARKOV, Vyacheslav BABURIN, S.A. GAVRILOVA, V.V. GRAYZNOVA, A.V. DANILINA, A.V. MARTYNOV (Russian Federation)*

Landslide processes occur practically within all the territory of the Northern Caucasus. The most landslide hazardous areas are the Black Sea coast of the Caucasus, mountain and submountain parts of the Krasnodar Region and the Republics of Karachaevo-Cherkessia and Dagestan. As an indicator of landslide risk value estimation of probable annual damage from landslides impact within municipal unions (administrative areas) was applied. The risk estimation is based on its dependence on susceptibility of territories to landslides (repeatability of landslides), vulnerability of territories from landslides in space and in time. The greatest values of landslide economic risk are characteristic for municipal areas of the Krasnodar Region (more than 1 million roubles/year), Karachaevo- Cherkessia (more than 1,5 million roubles/year), the Stavropol Region (more than 1,5 million roubles/year) and especially Dagestan (more than 20 million roubles/year).



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**Recent rockfalls and rock avalanches in the high mountains (case study of the Caucasus)**

*Elena SAVERNYUK (Russian Federation)*

We investigated recent rockfalls and rock avalanches in high-mountain zones of the Caucasus. We interpreted the aerial and satellite images, and used the data of our aerial and ground surveys. We collected the data about of rockfalls, and compiled the inventory which includes several dozens of events occurred in the period between 1959 and 2014. Some large rockfalls transformed to rock and ice-rock avalanches. In several valleys, rock avalanches accumulated on glaciers. Initiation zones of rockfalls and rock avalanches located between 2700 and 4500 m. We recognized the activation of small rockfalls on slopes of glacier cirques. Some events occurred in places without rockfall traces in the past. Many of rockfalls and rock avalanches are concentrated around Mt. Kazbek on the border of Georgia and Russia. Warming of climate, degradation of permafrost, and endogenic processes are the main factors of activation of rock avalanches in the region.



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## Assessment of glacial lake outburst flood and debris flow hazard in Northern Afghanistan

*Sergey CHERNOMORETS, Elena SAVERNYUK, M.D. DOKUKIN, Olga TUTUBALINA, K.S. VISKHADZHIEVA*

We have completed the first stage of an assessment of remote hazards in Wakhan and Zebak districts of Badakhshan Province, Afghanistan. It included a literature review of publications in English and in Russian and a short fieldwork in the region in 2014. We compiled Inventory of lakes in Wakhan and Zebak districts using automated interpretation of glacial lakes in Landsat 8 OLI satellite images, and visual interpretation in very high resolution satellite images. The inventory includes 347 lakes with an area over 5,000 sq. m each. We have prepared an album of image interpretation maps for all lakes. We have also studied dynamics of selected glacial lakes through comparative interpretation of satellite imagery. We have developed a geographical information system (GIS) including: - vector layers: lakes, possible remote hazards (outbursts, surging glaciers, rock avalanches and rockslides, potential debris flow origination sites, possible locations of river damming), hydrography, settlements, human activity zones, houses; - raster layers: satellite images, scanned topographic maps, digital elevation model. We have compiled a Map of remote hazards in Wakhan and Zebak Districts in Badakhshan Province, Afghanistan, using the Inventory of lakes and data received during field work in 2014. Finally, we have developed criteria of glacial lake outburst flood (GLOF) hazard assessment, assessed hazard in catchments of Wakhan and Zebak, and made a list of sites with the highest hazard.



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IGU2015 – 1221

**Large-scale indicators of extreme rainfall in the coastal natural and economic zones of European RussiaLarge-scale indicators of extreme rainfall in the coastal natural and economic zones of European Russia**

*Tatiana MATVEEVA, Daria GUSHCHINA (Russian Federation)*

Extreme events, in particular extreme precipitation, present natural hazards for population and result in immense losses for economic. The special attention may be drawn to the coastal zones, where intensive economic use of territory increases the losses resulting from inundation. The climate change involves the change of specific components of climate system, in particular the precipitation amount. However the trends of annual precipitation are not always consistent with the changes of extreme precipitation occurrence, the latter being the most dangerous for population. As the rainfall (especially extreme) are fairly simulated by the climate models an alternative method for assessment of extreme precipitation changes is used, based on the analysis of large-scale synoptical indicators associated with extreme rainfalls. For Black Sea coastal area and European Arctic coast the certain meteorological conditions resulting in extreme precipitation are detected: specific configuration of the pressure field, formation of intensive frontal zone in the area of extreme rainfall. The latter is specified in dependence of region: for Black Sea coastal region the threshold is the strong temperature gradient at 850 hPa, for European Arctic coast area the threshold for the frontal parameter is applied. The analysis of synoptical indicators of precipitation in the warming climate of XXI century allows to estimate the changes of extreme precipitation occurrence: in the Black sea region the increasing of extreme precipitation is attended in summer, while on the Arctic seaside the probability of extreme precipitation increases in the cold season. The investigation is supported by Russian foundation for basic researches (grants No 13-05-00436, 15-05-06693)



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IGU2015 – 1778

**Extremal exogenic processes in Cherek Balkarsky basin in 2009-14**

*Vadim KARAVAEV, A.VOSKOVA, S. BULANOV, S. SEMINOZHENKO (Russian Federation)*

We can observe the trend of warming accompanied increasing of precipitation in the autumn and for the whole year, more frequent heavy rains on the North Caucasus from 1970th. The consequence of warming is the degradation of mountain glaciers. The results of these processes are increase of river flow, activation of the formation of dammed lakes and the accumulation of a large amount of clastic material at the end of the 20th century. This material is involved in the exogenic processes. This situation is favorable for floods in foothill areas. Our group researche the specific of exogenic processes in the upper reaches of the Cherek Balkarsky River, upstream of the Verhniaja Balkaria village and in basins of sources of this river – Karasu and Duihsu from 2009. The chief meteorological factors of the exogenic processes are precipitation and temperature of air – their absolute and middle, variation and the ratio. A frequency and force of exogenous processes are strongly depended on the properties of the vegetation cover and its spatial distribution. The vegetation cover occupies not more than ¼ of the study area and forests occupy not more than 5% of it. The most warm summer periods during last 6 years were registered in 2010 and 2011. The summers of 2012 and 2013 were rather rainy. The summer of 2013 was unusually coldly. The great snowfalls were in March 2009 and in March 2010. The greatest avalanches were in the March 2009 and in the March 2010. The 4 debris flow and avalanching geosistems were found in the studied region. There are two large landslides: one of them was particularly active in 2013. Another which had anthropogenic genesis is active almost every year. The frequency of rockfalls and quantity of material were lover in 2012 and 2013 than in 2009-11, especially in highland, according to field data. It can be explained by cold summers of 2 last years. The melting of dead ice near glacier margin was very active in 2010-11. As a result the area of glacial landscapes is being diminished and rock debris appeared. It can be involved in the other processes.



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## Extreme wind speeds in the Barents and Kara Seas

*Larisa SOKOLOVA, Galina SURKOVA, Artjom CHICHJOV (Russian Federation)*

Barents and Kara seas have great economic importance for Russian Federation. In their water area fishing and productions of hydrocarbons are developed. The Northern Sea Route passes through these seas. Rather warm Norwegian Sea and cold areas of the Arctic basin have impact on climate of these seas. The trajectories of the movement of the North Atlantic cyclones are going east and the northeast deep into the Arctic area, passing through the basins of the Barents and Kara seas, and thus resulting in big variability of weather conditions, especially the wind. The wind is characterized by frequent repeatability of the high speeds which are quite dangerous to water crafts, offshore installations and coastal buildings. Repeatability of sea disturbance increases at a strong wind with the reduction of the sea ice area in the Arctic. That increases danger of the coastal erosion. Long-term planning of different types of activities in the Arctic assumes understanding of the current processes that lead to the development of extreme phenomena, and climatic forecasting of possibility of the recurrence of these phenomena, especially the dangerous wind speeds. This work contains the analysis of the average wind speed daily maxima (at the height of 10 m, 8 terms per day) during the period of 1950-2012 according to the data of the 20th century reanalysis, NCEP/NCAR. Their distribution functions, long-term variability during the climate changes of the Arctic and the relation of the greatest wind speeds to the synoptic situations that are typical for the storm phenomena in the central regions of the seas for a summer season were also investigated. The assessment of the distribution functions will allow to move on to the repeatability of extreme wind speeds at different climatic scenarios and further climatic forecast of the wind mode for 21st century.



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IGU2015 – 3422

**From accident to accident: changes in the avalanche hazard assessment**

*Ekaterina LOGINOVA, Alla TURCHANINOVA, Yuri SELIVERSTOV, Tatiana GLAZOVSKAYA, Marina VIKULINA (Russian Federation)*

The safe exploitation of Mountain regions depends on their influence to natural mass movement hazards, such as snow avalanches, debris flows and rockfalls. We are going to discuss this problem in terms of snow avalanche hazard assessment as an essential part of engineering in the world and Russia. The rapidly increasing snow avalanche hazard in Russia is a result of the accelerated growth of the mountain recreation as well as mining industry. Unfortunately, great avalanche accidents worked as a trigger for the appearance of snow avalanche research groups as well as the development of avalanche hazard assessment approaches. For example great avalanche events: in Kirovsk (Russia, 1935); in Alps (1951, 1954, 1999); etc. Each of this avalanche event influenced on the views of the avalanche assessment, forecast, mapping and modeling, etc. This paper describes the various approaches for the avalanche hazard assessment that appeared due to big avalanche disasters. Unfortunately there is no useful technical avalanche guideline in Russia. However it gives more freedom to Russian developers but causes lots of uncertainties concerning the safety of people. Certainly there is no sense in waiting of the next awful avalanche event. We are going to present a new approach of the avalanche hazard zoning in Russia based on the Alpine concepts as well as traditional Russian methods. Avalanche zoning as a process for identifying areas endangered by snow avalanches of different intensity on a map and regulating the types of land uses allowed is widely used in the World but is not yet used to prevent construction in endangered areas in Russia. We hope that after validation our approach could be implemented into Russian snow engineering practice.



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## Environmental effects of de-icing agents in the soils of the Eastern District of Moscow

*Natalia KOSHELEVA, E.M. NIKIFOROVA (Russian Federation)*

The most environmentally dangerous consequence of anthropogenic halogenesis resulting from the use of de-icing agents in Moscow and other northern cities is their alkalinization due to the entry of exchangeable sodium in the soil absorption complex. As a result, a number of soils acquire more negative properties than under salinity. Anthropogenic alkaline soils have a low natural fertility, a negative impact on green areas, often causing their destruction. Long-term dynamics of anthropogenic alkalinity of soils in the Eastern Administrative District (EAD) of Moscow was studied. The results of soil geochemical surveys of urban and background soils in 1989, 2005, 2010 were analysed. Easily soluble salts in the 160 soil samples were determined by aqueous extract, exchangeable cations – using method of Pfeiffer. The average content (%) of the solid residue of soluble salts in urban soils changed from 0.31 in 1989; 0.39 in 2005; to 0.48 in 2010; the average content (mmol(eq)/100 g) of the exchangeable sodium cation varied within 0.38 in 1989, 0.63 in 2005 and 0.80 in 2010. The background values of these parameters are 0.03 % and 0.13 mmol(eq)/100 g respectively. The degree of alkalinity of soils averages (% of the cations' sum): 1989 - 3.15; 2005 - 4.92; 2010 - 7.22 compared with 1.38 on the background area of Podmoskovnaya Meschera. The differences in the content of exchangeable sodium in soils of different land-use zones were determined. Maps of anthropogenic alkalinity in soils of EAD of Moscow for three years were compiled detecting long-term trends in alkalinity of urban soils and predicting their further development. The most intense and extensive man-made anomalies with high alkalinity of soils were developed near major highways and industrial zones



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IGU2015 – 1832

**Channel Processes Hazards - Displays, Frequency, Risks**

*Alexandr ZAVADSKIY, Alexey CHERNOV (Russian Federation)*

Changes in planned figure of river channels - channel deformation, can be dangerous to humans. The danger occurs due to banks destruction and alluvial ridges movement on the bottom of the river. Buildings, which were located on the shores, roads, which were held along the banks, supports of bridges, power lines, pipelines can be destroyed. Sometimes whole streets of villages and towns are washed away by the river. Hazard assessment of river-bed processes is carried out as a high, medium or low, and quantitatively as an average speed of bank erosion, offset of alluvial ridges or integrated in points. For the assessment of the geographical distribution of river-bed processes danger in Russia we used mapping method to show the danger of river-bed processes on the whole territory of the country and in separate river basins. These maps show the regions with increased risk of river-bed processes, average on scale of danger and areas, safe in regard to the erosion of shores and alluvial ridges offset. Detailed characteristics of the hazard, the magnitude of its manifestations and consequences for coastal and fluvial constructions are given in the legend of these maps. The combination of the potential dangers of channel processes at various scales with a real or planned exploration of coastal areas, gives the opportunity to estimate the risk of exploration of rivers and their banks, which are different in river-bed processes hazard potential.



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# The tendency of hazardous geological processes development on the territory of Russia at the beginning of the XXI century

*Boris KRESTIN, Irina MALNEVA, Nina KONONOVA (Russian Federation)*

During the period of modern climatic anomalies regional assessment of the trends of haz-ardous exogenic geological processes (HEGP) development becomes of utmost importance, in particular that of landslides and mudflows, which manifestations can have disastrous conse-quences. To assess the hazard of developing HEGPs in a specific region information about their ac-tivity, meteorological data (air temperature, rainfall) and the Calendar of consecutive change of elementary circulation mechanisms (ECM) in the atmosphere of the Northern hemisphere on the B. L. Dzerdzeevskii classification are used. ECMs that determine the weather conducing activa-tion of landslides and mudflows in a particular region are identified. It is established that the strong activation occurs under the combined effect of natural and anthropogenic factors (Northern Caucasus in June 2002 and in July 2012, the Big Sochi area in 2013). The periods of strongest activity of HEGPs are determined by the periods of meridional circulation, equally North or South. Taking into consideration the contrast of the modern climate and the increasing anthro-pogenic impact, in the coming years the territory of the Russian Federation will most likely see a significant increase in the danger of catastrophic manifestations of HEGPs, especially landslides and mudflows.



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# C12.06 Cold Region Environments

# C12.32 Mountain Response to Global Change

## Mountain cryosphere in a changing climate: data and observations 1

**Chairperson(s):** *Tatiana VLASOVA, Tatiana KHROMOVA*

- Monitoring snow cover variability in the Upper Rhine Region with improved MODIS snow products and a hydrological model

  *Chunyu DONG, Lucas MENZEL (Germany)*

- Comparing the evolution of a debris-covered glacier and a clean-ice glacier

  *Pierre Lardeux (France); Neil Glasser, Tom Holt, Bryn Hubbard (United Kingdom)*

- Temperature inversions in the mountain-hollows landscapes of southwestern Pribaikalie

  *Nadezhda VOROPAY, Oxana VASILENKO (Russian Federation)*

- Simultaneous isotope-hydrochemical investigations and modeling to study the runoff valuations of highland catchments (case study for Djankuat river basin, North Caucasus)

  *Nadezhda LOSHAKOVA, E. RETS, J. CHIZHOVA, Yu. VASILCHUK, I. TOKAREV, N. BUDANTSEVA, N. FROLOVA, M. KIREEVA, V. POPOVNIN (Russian Federation)*

- Mountain glaciers changes on the territory of Russia

  *Tatiana KHROMOVA, Gennady NOSENKO, Stanislav NIKITIN, Anton MURAVIEV (Russian Federation)*

## Mountain cryosphere in a changing climate: data and observations 2

**Chairperson(s):** *Tatiana VLASOVA, Tatiana KHROMOVA*

- Possible causes of the intensive melting of glaciers of the Greater Caucasus in the last 20 years

  *Pavel TOROPOV, Vladimir MIKHAILENKO, Stanislav KUTUSOV, Ivan LAVRENTIEV, Polina MOROZOVA (Russian Federation)*

- Isotopic composition of snow in Eastern Alps, NW Slovenia

  *Polona VREČA, Mihael BRENČIČ, Iztok SINJUR, Gregor VERTAČNIK, Jaka ORTAR, Manca VOLK BAHUN, Miha PAVŠEK, Dušan POLAJNAR (Slovenia); Sergey SOKRATOV (Russian Federation)*

- Dynamics of the glaciers of southwestern Altai and northwestern Mongolia since the LIA

  *Dmitry GANIUSHKIN, Kirill CHISTYAKOV (Russian Federation)*

- Present glaciation of southeastern Altai and norhwestern Mongolia

  *Dmitry GANIUSHKIN, Kirill CHISTYAKOV (Russian Federation)*



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## POSTER EXHIBITION

- Heat balance features of glaciers of the Greater Caucasus from observational data

  *Pavel TOROPOV, V.V. POPOVNIN, K.A. AKHIAROVA, A.A. SHESTAKOVA, E.S. ASTAFIEVA, T.A. MATVEEVA (Russian Federation)*

- The stationary avalanche research observations on the Elbrus Educational and Scientific Station of the Faculty of Geography, Moscow State University

  *N.A. VOLODICHEVA, A.D.OLEYNIKOV (Russian Federation)*



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**Monitoring snow cover variability in the Upper Rhine Region with improved MODIS snow products and a hydrological model**

*Chunyu DONG, Lucas MENZEL (Germany)*

MODIS snow data has been widely used in hydrological research in the past decade because of its high temporal and spatial resolution. However, cloud obstruction and snow misclassification limit its availability as continuous snow time series. In this paper, we developed a new methodology coupled with in-situ meteorological data, aiming at the improvement of MODIS snow products. A case study was executed in the topographically heterogeneous Upper Rhine Region (southwestern Germany) from 2002 to 2013. The cloud coverage and snow overestimation error of MODIS snow products were both reduced significantly. Additionally, the snow water equivalent during 1961-2008 was simulated using a spatially distributed hydrological model. It showed high consistency with ground based snow measurements. Using the updated MODIS snow data and simulated snow water equivalent, we analyzed the spatio-temporal variation of snow pack in the study area. The results demonstrate that the main snow parameters, such as snow coverage, onset date, end date and snow duration, varied along with elevation. Moreover, the influences of climatic factors and spatial factors on snow cover were both analyzed with statistical model.



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**Comparing the evolution of a debris-covered glacier and a clean-ice glacier**

*Pierre Lardeux (France); Neil Glasser, Tom Holt, Bryn Hubbard (United Kingdom)*

The evolution of debris-covered glaciers is poorly understood, especially the glacier-wide effects of the supraglacial debris layer. However, debris-covered glaciers are responsible for part of the large uncertainty (20%) in sea level rise (SLR) attributed to mountain glacier melting (27% of SLR from 2003-2010). Additionally, debris-covered glaciers are the main water supply in many regions, for example the Himalayas, and can also be the source of glacier-related hazards. This project will help to better assess the evolution of debris-covered glaciers in response to recent and current climate change through a combination of optical remote sensing, Structure-from-Motion (SfM) techniques and field observations. We compare a debris-covered glacier (Glacier Noir) with an adjacent clean-ice glacier (Glacier Blanc) in the French Alps. These glaciers are unique in that they are subject to similar climatic conditions and have a similar morphometry. We compare these glaciers on two different timescales: over the last century and over one month at the end of the melting season 2014.On the century scale, SfM techniques allowed the reconstruction of length, surface area and elevation variations of both glaciers. At the month scale, field techniques allowed the quantification of hydrological differences between these glaciers especially their drainage system (type, reactivity, extend) and their meltwater quality. Fieldwork also allowed the assessment of velocity and structural differences through GPS measurement and time lapse photography. Finally ground-based photogrammetry gave us an opportunity to improve our topographical understanding of these glaciers through the reconstruction of digital elevation models. All these observations help to build our glacier-wide scale comparison.



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**Temperature inversions in the mountain-hollows landscapes of southwestern Pribaikalie**

*Nadezhda VOROPAY, Oxana VASILENKO (Russian Federation)*

Monitoring of air temperature at Tunkinskaya and Mondinskaya hollows is a part of integrated geographical studies of the Institute of Geography of the Russian Academy of Sciences (Irkutsk). Year-round observations of air temperatures are carried out with using of electronic temperature sensors. Sensors were mounted at 35 observation sites located at different altitude a.s.l. Each site has a specific landscape characteristics. 23 model sites are located in the Tunkinskaya hollow at altitudes from 718 to 2119 m a.s.l., 12 sites – in the Mondinskaya hollow at altitudes from 1274 to 2325 m a.s.l. The air temperature was recorded each 3 hours synchronously with standard measurements at weather stations. In this paper we study the inversion of air temperature on the mountain slopes of different exposures over a period from 2009 to 2013. The temperature gradient was determined as the difference between the air temperatures in the same time at different altitudes related to altitudes difference. There is an inversion when temperature gradient is negative. The obtained results demonstrated features of the distribution of temperature in a mountain-hollow landscape. It can be extrapolated to a vast area and modeling of regional climate peculiarities. This is actual, due to difficulties with organization of long-term observations in remote areas.



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# Simultaneous isotope-hydrochemical investigations and modeling to study the runoff valuations of highland catchments (case study for Djankuat river basin, North Caucasus)

*Nadezhda LOSHAKOVA, E. RETS, J. CHIZHOVA, Yu. VASILCHUK, I. TOKAREV, N. BUDANTSEVA, N. FROLOVA, M. KIREEVA, V. POPOVNIN (Russian Federation)*

Glacial-nival zone plays an important role in the formation of mountain river flow. The rivers with a high rate of glacial nourishment identify hazards taking place in the mountains. Djankuat river basin was selected as the representative for the North Caucasus during the International Hydrological Decade. Complex observations of glacier mass balance, runoff, meteorological characteristics and isotope-hydrochemical investigations are conducted. Also snow and ice melting for ablation season was simulated. It is shown, that only the part of melt water is discharged from the catchment area during the ablation season. This is due, primarily, with a secondary transfer of the melt water into the ice. This determines the inertia of the glacial runoff and high values of the autocorrelation coefficient. Runoff fluctuation during the day, so-called "fast" flow, formed by meltwater having the lag time of about 3-4 hours in June and July, 2-3 hours in August and September. Oxygen isotopes (d18O) is widely used as an indicator for different water origins. According to the results we can conclude that d18O is a clear marker of melting winter snow. The heaviest at d18O isotopic composition associated with summer precipitation. The isotopic composition of glacial ice can vary considerably accordingly to the weather conditions during the freezing period. The study was supported by the Russian Science Foundation (project no. 14-17-00700 in modeling, project no. 14–27–00083 in isotope analysis) and by the Russian foundation for basic research (projects no. 14-05-31239) in observational data analysis.



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IGU2015 – 1665

## Mountain glaciers changes on the territory of Russia

*Tatiana KHROMOVA, Gennady NOSENKO, Stanislav NIKITIN, Anton MURAVIEV (Russian Federation)*

Mountain glaciers being dynamically unstable systems reveal rapid reaction on climate change. Glacier recession implies the landscape changes in the glacial zone, origin of new lakes and activation of natural disaster processes, catastrophic mudflows, ice avalanches, outburst floods, and etc. The presence of glaciers in itself threats to human life, economic activity and growing infrastructure. Economical and recreational human activity in mountain regions requires relevant information on snow and ice objects. Absence or inadequacy of such information results in financial and human losses. One of the urgent aims is to study the current trends in development of mountain glaciation of the Earth in conditions of global climate warming. The unbiased assessment of current and future development of glaciers requires effective system of monitoring including in-situ and remotely sensed studies. In the paper we give an overview of recent results on mountain glaciers inventorying and mountain glacier changes on the territory of Russia received both by surface measurements and remote sensing observation.



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IGU2015 – 1901

**Possible causes of the intensive melting of glaciers of the Greater Caucasus in the last 20 years**

*Pavel TOROPOV, Vladimir MIKHAILENKO, Stanislav KUTUSOV, Ivan LAVRENTIEV, Polina MOROZOVA*
*(Russian Federation)*

It is considered that a negative glacier mass balance is determined by temperature anomalies during the ablation and the lack of winter precipitations. However, it is difficult to confirm or to deny these seemingly obvious conclusions because of the lack of systematic meteorological observations in the mountains. The only source of long-period series of meteorological data in the glacial areas of the Greater Caucasus are the results of the regional and global reanalysis performed by numerical weather prediction models. In this work a widely known reanalysis NCEP/NCAR is used, because it covers a significant period of time (1948-2014 years). Statistical verification of the reanalysis data was performed for the summer season using seasonal meteorological measurements carried out in different areas of Mount Elbrus in 1960, 2007 and 2013. This verification showed that the reanalysis successfully reproduces the temperature and humidity conditions of Elbrus and its surroundings. This fact allows us to use reanalysis data for reproducing meteorological regime of the Central Caucasus in the last 65 years. It is shown that the air temperature and humidity characteristics in the high-altitude areas of Elbrus were changing slightly. However, the intensive melting of glaciers is observed, especially in the period 2000-2010. According to the reanalysis, verified by the observations, a possible reason of the increased layer of glacier ablation could be an anomaly of the radiation balance, the value of the balance for the period 2001-2010 exceeded the average climatic value (1961-1990) on 5%. This result could be important because 85-88% of ablation energy on the Greater Caucasus is exactly the radiation balance. It is interesting that the increase of the radiation balance during 2001-2010 period occurred due to the growth of the downward flux of the long-wave radiation. It could be caused by the increasing of moisture content of atmospheric column or by the increasing of the greenhouse gases concentration.



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**Isotopic composition of snow in Eastern Alps, NW Slovenia**

*Polona VREČA, Mihael BRENČIČ, Iztok SINJUR, Gregor VERTAČNIK, Jaka ORTAR, Manca VOLK BAHUN, Miha PAVŠEK, Dušan POLAJNAR (Slovenia); Sergey SOKRATOV (Russian Federation)*

In Alpine climate zone the storage of precipitation in snowpack, and the subsequent spring melting, substantially impacts the water cycle. Julian Alps and Karavanke represent southern part of Eastern Alps and are under the influence of mixing air masses that influence considerably accumulation of snow and its characteristics. Stable isotopes of oxygen have been used to study snow deposition and the subsequent alteration of snowpack characteristics worldwide. However, in Slovenia we started with snow isotope investigations only recently. We performed first isotope investigations of snow in 2011 and collected samples from 5 snow profiles in Julian Alps. We continued in winter 2011/12 when sampling of snow profiles was limited due to particular climate conditions (i. e. low precipitation) and 7 snow pits were investigated in Julian Alps and Karavanke. In winter 2012/13 we expanded sampling to more locations and investigated 21 snow pits in Julian Alps and 2 in Karavanke. We tested few different sampling techniques and determined in all collected samples isotopic composition of oxygen. Heterogeneities in snow profiles formed during warmer periods typical for winters in alpine part of Slovenia caused some problems in representative snow sampling and also in interpretation of results obtained. We observed considerable variations in isotopic composition of snow in time and space, and also in particular snow profile. Changes in isotopic composition through the profiles indicate the influence of dry and wet metamorphism, phase changes due to the influence of snow sublimation and vapour diffusion through the snowpack, different precipitation events and changing conditions during few days snow precipitation event.



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**Dynamics of the glaciers of southwestern Altai and northwestern Mongolia since the LIA**

*Dmitry GANIUSHKIN, Kirill CHISTYAKOV (Russian Federation)*

Dynamics (since the maximum of the LIA) of the glaciers of South-East Russian and North Mongolian Altai has been studied. Data has been obtained for 15 areas of glaciation from Tavan Bogd and Mongun-Taiga in the north-west to Tsambagarav in the south-east. The research is based on multiyear in situ observations and analysis of aerial photos of mid-1960-s and high resolution space imagery. The last glacial advance in the maximum of LIA according to dendrological data finished in the first half of the XIX century. From the maximum of the LIA the glaciation of the region lost about 51%, ELA average uplift was 89 m. On the background of general trend of glacial retreat there were several periods of stabilization of glacial fronts, the most distinct in mid-1960-s. In the last 50 years there were 2 warm and dry intervals- in 1972-1981 and 1992-2008 and 3 cool; and moist intervals – before 1972, in 1982–1994 and after 2009 г. It caused fluctuations of firn line altitude with about 300 m range and abrupt changes of glacial area. Maximal changes were observed between 1995 and 2008, when areas of the glaciers decreased with average rate 1-2% year. Determination of retreat of glacial snouts after the LIA by geomorphic features is described by VI-phase scheme.



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**Present glaciation of southeastern Altai and norhwestern Mongolia**

*Dmitry GANIUSHKIN, Kirill CHISTYAKOV (Russian Federation)*

Present state of the glaciers of South-East Russian and North Mongolian Altai has been studied. Data has been obtained from 15 areas of glaciation from Tavan Bogd and Mongun-Taiga in the north-west to Tsambagarav in the south-east. The research is based on multiyear in situ observations and analysis of aerial photos of mid-1960-s and high resolution space imagery. 553 modern glaciers with total area 313.4 km2 have been mapped and put down into catalogues, including glaciated areas and glaciers that have not been studied before. Glacial complexes with united accumulation zone and flat-summit glaciers in the center and valley glaciers on the sides are typical for the area of research. The firn line level rises from 3200-3300 m in the west to 3600-3700 m in the east. This tendency reflects the reduction of nourishment of the glaciers in this direction due to decrease of precipitation. The largest valley glaciers exist on the north-eastern leeward slopes as a result of 2-3-fold concentration of snow. Now the glaciers retreat with rates reaching in several cases 30 m/year.



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## Heat balance features of glaciers of the Greater Caucasus from observational data

*Pavel TOROPOV, V.V. POPOVNIN, K.A. AKHIAROVA, A.A. SHESTAKOVA, E.S. ASTAFIEVA, T.A. MATVEEVA (Russian Federation)*

Ablation of mountain glaciers is determined by the heat balance of the surface, the main components of balance are: radiation balance, turbulent heat exchange between glacier surface and the atmosphere, the loss of heat by evaporation, heat flux into the ice body, heat from the liquid precipitation, as well as the heat of condensation on the surface. Depending on the region and season, the role of each component of the heat balance varies. Quantitative assessment of these components is needed to understand the physical mechanisms of ablation, which is a critical component of the mass balance of the glacier. This requires a whole set of meteorological observations. A systematic meteorological and actinometrical observations and the level of the ice surface monitoring are conducted on glacier Dzhankuat since 2007 in the ablation period (June-September) with an automatic weather station CAMPBELL. Since 2010, there were a few sets of gradient observations with Assman psychrometers and Fuss anemometers. In 2014 a direct measurements of turbulent heat flux were made using acoustic anemometer GILL. As a result, values of the radiation balance and turbulent fluxes were obtained in the last 7 ablation seasons with the help of different methods (heat balance method, Monin-Obukhov method, method of turbulent pulsations). It was shown that, depending on the cloudiness determined by the synoptical conditions, the contribution of the radiation balance in the total energy ablation varies between 80-90%, the sensible heat flux is 7-15%, and the loss of heat by evaporation from the surface of the glacier is 2- 4%. It was shown also that such variables as heat flux into the ice, heat flux with liquid precipitations and heat of the condensation on the surface are negligible and do not exceed 1%. Thus, the main factor determining the ablation of glaciers of the Central Caucasus is radiation balance.



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# C12.10 Gender & Geography Commission
# C12.33 Commission on Political Geography

**Gender Activisms in Asia: Peoples, Places and Politics**

**Chairperson(s):** *Shirlena HUANG, Chih Yuan WOON*

- Spaces of Gay Activisms: Contesting the Illberal Pragmatics of 377A in Globalizing Singapore
  *Shirlena HUANG, Chih Yuan WOON* (Singapore)
- The Missing Gender Concern In Resettlement Planning At Sardar Sarovar Dam Resettlements In Vadodara, Gujarat
  *Gaurav SIKKA (India)*
- Denialism of Comfort Women through Discourse
  *Derya OZVERI (Turkey)*
- Exploring gender relations and violence in educational institutions
  *Ado Mukhtar BICHI (Nigeria)*
- Reframing Resistance: Bodies, Gendered Activism And Counterspaces In The Everyday And The Emergent
  *Anindita DATTA (India)*



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**Spaces of Gay Activisms: Contesting the Illberal Pragmatics of 377A in Globalizing Singapore**

*Shirlena HUANG, Chih Yuan WOON* (Singapore)

In December 2012, a gay couple launched a constitutional challenge against Section 377A of the Penal Code of Singapore (hereafter '377A') which criminialises sexual acts between mutually consenting adult men. Since then, a sizable corpus of academic studies (particularly hinging on legal perspectives) has emerged to reflect on the constitutional basis of this so-called 'anti-gay' law in Singapore. Whilst these works provide a good overview of the legal justifications for either the repealing or retaining of 377A, there has been a relative neglect of how the law is bound up with broader (changing) meanings and debates about the status of homosexuality in Singaporean society. This paper fills in the lacuna by tracing the genealogy of 377A to demonstrate its close links with the state's (re)workings of gay identities in Singapore. Specifically, we argue that although 377A is a colonial legacy whose origin cannot be divorced from biomedical discourses that once pathologised gay individuals as 'abnormal Others', there has been a gradual opening up of discursive and material spaces allowing for the recognition of the gay community as rightful citizens even while preserving the illegality of (male) homosexual identity. This gradual shift in state rhetoric and policy constitutes what Yue (2012) terms 'illiberal pragmatics' whereby the emergence of a 'queer' Singapore is fraught with tensions and contradictions (e.g. Asian traditions and cultural values versus western modernity and global city imperatives). However, it is precisely the state's ambivalent position on appealing to conservative 'majority' values whilst promoting an outward-looking cosmopolitan Singapore that has enabled the (re)claiming of activist spaces to contest the heteronormative agendas underpinning 377A. We contend that space is fully implicated in que(e)rying Singapore and a geographical approach can offer much to understanding the constructions and responses to homosexuality in globalizing Singapore (and beyond).



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**The Missing Gender Concern In Resettlement Planning At Sardar Sarovar Dam Resettlements In Vadodara, Gujarat**

*Gaurav SIKKA (India)*

Development projects like dams bring tremendous changes in patterns of use of land, water, and other natural resources which leads to a range of resettlement effects. This process of economic and social dislocation most often exacerbates existing gender disparities and inequalities in affected areas. When gender differences are overlooked in project planning phase, projects are unlikely to respond to women's need and may even have negative consequences. In this present study, it was found that while planning resettlement sites for the Sardar Sarovar dam affected families; the necessity of having toilets was completely ignored. This research note provides empirical evidences to voice the case of gender blindness prevalent in access to basic amenities in Sardar Sarovar resettlements in Vadodara, Gujarat. The manuscript also calls for the inclusion of gender issues and social equity in assessment, design and implementation and monitoring must be made a compulsory element for large-scale development projects like dams.



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**Denialism of Comfort Women through Discourse**

*Derya OZVERI (Turkey)*

The vivisection of prisoners, biological warfare, systematic rape etc..are one of the many human rights violations in war times and injustice regarding to punish or create the awareness of these war crimes are still in tact however International crimanal tribunal are prosecuting these crimes though it may still not enough for the recognition. In the literature the causes for the inefficieny of the recognition of war crimes is mostly explained by the social, economic, cultural and political structures in societies provide for denialist defense mechanisms with the help of the the true nature of the problems involved remains fully or partly unacknowledged so the appropriate action remains absent especially with the official discourses of the counterparts in which one part denies the responsibility while the other part denies the real essence of the crime which is the human rights side as in this case of ´comfort women´. The paper focuses on the issue of Comfort women (mostly Korean women in numbers) who are abducted and coerced to work as sexual slaves for the Japanese Imperial Army during the World War II and argues that the nationalist discourses of South Korea and Japan on the ´comfort women´ issue lead these very victims of military sexual slavery whose fate and wellbeing has no longer been the subject of any social interest, lost in the discourse based on the official statements from both parts; Japan continue to deny legal liability for the comfort stations and the victimisation of the comfort women, while South Korea disregarding the preferences of its individual victims under the nationalist discourse



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IGU2015 – 3180

**Exploring gender relations and violence in educational institutions**

*Ado Mukhtar BICHI (Nigeria)*

EXPLORING GENDER RELATIONS AND VIOLENCE IN EDUCATIONAL INSTITUTIONS ADO MUKHTAR BICHI Department of Geography, Faculty of Earth and Environmental Sciences Kano University of Science and Technology, Wudil, Nigeria _____ _____ Abstract Gender relation has many construct; in fact it varies with culture. To some it is perceived as a central dimension of power, in other words, access to power, resources and roles is powerfully conditioned by gender. To others however, gender is always situated in a context. It is often a social construct alongside race, class, culture, language and history. Violence on the other hand, refers to use of physical force on an individual that can lead to injury or damage of properties. Violence is used purposefully to cover a range of behavior, which intimidate or degrade the person they are aimed at (Kelly 1989). This study examines the nature of gender relations and incidence of reported violence in educational institutions using Kano University of Science and Technology, Wudil as a case study. Data was collected from 70 respondents composed of students, lecturers and administrative staff. Result shows a low incidence of violence against women in the University particularly rape related, which is 4.3% percent of reported cases of violence against women. Verbal abuse among students is the common form of violence in the University; female students are more prone to violence than their male counterparts. The study observed that gender based violence is sex selective due to the fact that males tend to have a domineering attitude towards the females. Furthermore, gender parity tends to hinder cordial relationship between students and members of staff. It is therefore recommended that the authorities should encourage cordial relationship among members of the community through series of sensitization workshops and enlightenment campaigns against all forms of violence on campus. _____ _____ Key Words Gender relations, violence, culture, social construct and intimidations Contacts: adobichi@yahoo.co.uk +234 (0) 8063973931 +234 (0) 7052650256

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**Reframing Resistance: Bodies, Gendered Activism And Counterspaces In The Everyday And The Emergent**

*Anindita DATTA (India)*

In the context of a shrinking state and growing instances of gendered violence in India, this paper attempts to examines how gendered resistances are being staged using the body and everyday practices as both the tools and sites of resistance. Drawing upon her earlier work on gendered activism and indigenous feminisms, the author attempts to distinguish two distinct forms of gendered activism. Of these, the formal structured activism seeking amendments in legislation is often seen to be more credible. Against this are the emerging, unstructured and often "in the moment" activism which has an equal if not greater subversive potential but remains under researched in the Indian context. These activisms are very gendered and increasingly deploy the body as not just the tool but also sites of resistance. Again, two distinct strands are differentiated here. One is the repertoire of everyday strategies (in the Certeuen sense) that are used either to momentarily subvert patriarchy or to negotiate personal agency within the household. The other is the collective as well as individual activism aimed at resisting gendered violence and appropriation of space. While the former is enacted within the household and enmeshed within everyday practices or strategies, the latter is usually staged collectively in public spaces. The common thread in both is the use of bodies as the only tools of resistance as well as the creation of counterspaces to support such resistances.



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# C12.10 Gender and Geography

# C12.34 Population Geography

## Geographies of International Student Mobility: The Roles of Gender, Class and Ethnicity

**Chairperson(s):** *Yvonne RIANO, Allan FINDLAY*

- When and how does gender play a role in processes of student mobilities? Insights from Switzerland

  *Yvonne RIAÑO, Etienne PIGUET, Annique LOMBARD (Switzerland)*

- Does the marketization of higher education shape the gender and class composition of international student mobility to the UK?

  *Allan FINDLAY, Helen PACKWOOD, Russell KING (United Kingdom)*

- Beyond career and labour prospective: Migration and mobility of international postgraduate students in Barcelona universities

  *Cristobal MENDOZA, Anna ORTIZ GUITART (Mexico)*

- Migration of human capital and geographical mobility of Philippine university students

  *Evans Rosauro I YONSON (Philippines)*

### POSTER EXIBITION

- African Students Mobility towards the Land of Confucius

  *Hans SEESAGHUR (Switzerland)*



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# When and how does gender play a role in processes of student mobilities? Insights from Switzerland

*Yvonne RIAÑO, Etienne PIGUET, Annique LOMBARD (Switzerland)*

The numbers and character of international student migration have changed in Switzerland in recent decades owing to growing global mobility, and the internationalization of higher education. In 2012, 29.2%, of all students enrolled at institutions of tertiary education had a foreign origin. This is by far the highest percentage of all OECD countries. Unfortunately, statistics on gender differences among international students are not available. Scholars are calling attention to role of the state and the social imaginary in gendering transnational processes and experiences of mobility (Pessar/Mahler 2003). Unfortunately, however, gender has received scant attention in the scholarly literature on international student mobilities. So far, we don't have a differentiated understanding of when and how ideas of gender roles influence the process of student mobilities, and their outcomes. This paper aims to contribute to that research gap. It has two objectives. First, to review the literature on the role of gender on international student mobility and to establish research gaps. Second, to present some first results from an on-going research project on "Student mobilities to Switzerland" regarding the question of how and when imaginaries of gender identities influence the decision of students of where to study, what to study, and their future mobilities for purposes of study and work. The paper is based on biographical interviews with international students who are currently studying at an institution of tertiary education in Switzerland.



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**Does the marketization of higher education shape the gender and class composition of international student mobility to the UK?**

*Allan FINDLAY, Helen PACKWOOD, Russell KING (United Kingdom)*

This paper commences with the simple yet key question 'Do those who study abroad for their university education represent a cross-section of all students?' We have previously attempted to answer this question for British students studying in other parts of the world, concluding that women from middle class families are more likely to engage in exchange programmes such as Erasmus. Explanations can be found in terms of forces such as class and the discipline choices of students. This paper attempts to ask the same question of international students coming to study in the United Kingdom. We distinguish between students from parts of the EU and students from the rest of the world and focus on degree rather than credit mobility. The second strand to the paper is an investigation of the effect of marketization of higher education on the selectivity of international student migration. The paper argues that too much emphasis has been given to 'choice'- based models in explanations of student mobility. Instead this paper suggests that the shaping of higher education through marketization has meant that those who recruit students to study in the UK are no longer concerned solely in finding the 'best and the brightest'. Changing recruitment practices may therefore have had some role in altering the class and gender composition of international student mobility.



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IGU2015 –0060

**Beyond career and labour prospective: Migration and mobility of international postgraduate students in Barcelona universities**

*Cristobal MENDOZA, Anna ORTIZ GUITART (Mexico)*

Students´ international mobility has been researched following three main lines of analysis: (i) international students as a subset of highly skilled migration; (ii) student mobility as a product of globalization; and (iii) mobility placed in the context of youth culture and geography of mobility consumption, with students' mobility as a chance of enrichment to their lives and experiences. Considering this later approach, the paper explores motivations for migration to Barcelona, labour trajectories at the light of future expectations and everyday lives of 30 PhD foreign students who are temporarily living in Barcelona. Reasons for emigration to Barcelona are not restricted to career opportunities, but they also relate to city´s attractiveness. Mainly for this, some interviewees express their intentions to work subsequently in Barcelona. This desire is sometimes expressed in sceptical terms, since the current stressful financial situation of Spanish (and many European) universities casts shadows on their preferences. Indeed most of interviewed Latin Americans believe that, if returning, they will get better job positions. On the other hand, living abroad is regarded as a point of no return in young people's transitions towards independence and adulthood. The paper explores the complex process of leaving home in relation with everyday spatial practices and experiences. Gender differences regarding this process are quite remarkable. In this regard, especially for the case of females, everyday lives in Barcelona open up previously unexpected personal choices, with the city offering many personal potentialities concerning alternative uses of public places.



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**Migration of human capital and geographical mobility of Philippine university students**

*Evans Rosauro I YONSON (Philippines)*

The international migration of human capital especially university students, fresh graduates and the highly-skilled professional from developing countries has become a major concern of national governments in Asia. This growth of foreign students in the more developed world is attributed to two possible factors: the magnetic power of the world's top universities and the under-supply of university places in the developing countries. This paper tried to answer the following questions: what possible factors bring about the migration of university students from the developing world in the era of globalization? What leads to emigration and return migration? Using Ravenstein, Everett Lee, and Hirschman, the relationship between two points - the sending country and the receiving country. Variables such as age, gender, social class, distance, security, educational attainment, physical and political barriers, and family. This paper examined the movement of Filipino intellectuals. Motivations for their movement include the need for international quality education, growing dissatisfaction on national/local HEIs, presence of international HEIs in neighboring countries, and the strengthening of private HEIs in the country, among others. The study showed that Filipinos have a distinct migration case as reflected by its migration tradition and patterns, gender, social classes, the country's higher education system, the growing alternative higher education, the public vs. private universities set-up, the social and economic inequality, and the emerging usage of social media networks.



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**African Students Mobility towards the Land of Confucius**

*Hans SEESAGHUR (Switzerland)*

The increasing influx of African students towards China is a great attestation of intersectionalism within the sphere of the tertiary education industry. The experience of being a black student in the Land of Confucius must consider the interplay of ethnicity, gender, and class. This paper will be based on African students in select Chinese tertiary education institutions across China, and discuss about the factors that drive the African students to cross the geographic boundary and embark on a seemingly illogical journey in a country non-comparable to theirs on so many aspects. Sino-African co-operation has been flourishing over the years, with the Chinese Government setting up a series of full scholarship programmes (nearly 18,000 anticipated between 2013 and 2015) to sponsor African students to undertake tertiary education in Chinese universities. Since many Chinese universities are ranked internationally and provide the world's largest short-term training programs across an extensive range of study fields, this provides a unique and golden opportunity to African students to obtain a quasi-free international recognition, and attractive career prospects. However, the free ticket to a university degree may come at a social and psychological cost, often ignored by those seeking greener pastures. The overall experience of the students and their decision after their studies rely heavily on their choices regarding the city, the university and its experience with foreign students, the field of study, the medium in which the classes are taught, the duration of their course, and their entourage.



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# C12.14: Commission on Global Information Society
# C12.15 Geography of Tourism, Leisure, and Global Change
# C12.30: Commission on the Mediterranean Basin
# C12.39 Urban Commission: Urban Challenges in a Complex World

**Mega Events: The Role of Spectacle in Urban Development 1**

**Chairperson(s):** *Mark WILSON*

- Evaluating the Long Term Value of Mega Event Legacies
  *Mark WILSON (USA)*
- An archeology of mega-events? The example of the pilgrimage of Lourdes (France)
  *Oivier LEFEBVRE (France)*
- Mega Events as drivers of socio-economic development of cities (on the example of the Olympic Games Sochi-2014)
  *Mariya GORYACHKO, V.L. BABURIN, P.L. KIRILLOV (Russian Federation)*

**Mega Events: The Role of Spectacle in Urban Development 2**

**Chairperson(s):** *Mark WILSON*

- Mega-event as a tool in the optimization of urban spatial structure: An entrepreneurial city in action
  *Lingyue LI, Roger C. K. CHAN, Ying LUO (China (Hong Kong))*
- Mega-events and festivals as indicators of world urban system from a cognitive-cultural dimension
  *Roberto DIEZ PISONERO (Spain)*
- Mega Sporting Events and Realities of Long-Term Grandeur Impacts on Urban Areas
  *Robert C. SCHNEIDER (USA)*

## POSTER EXHIBITION

- Mapping the global urban hierarchy beyond economic perspective: events and festivals
  *Roberto DIEZ PISONERO (Spain)*



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**Evaluating the Long Term Value of Mega Event Legacies**

*Mark WILSON (USA)*

Mega events, such as the Olympics and FIFA World Cup, create long term changes in the structure and appearance of their host cities. The legacies of these events are usually promoted as benefits for the host city's residents, but it is difficult to judge how much benefit these events eventually contribute. The planning and management of mega events is conducted by one organization that ends with the event, so that its long term planning horizon is usually limited. The fact that legacy site management is often passed to another organization than the event organizer further highlights the disconnection between events and their legacies. This paper will examine the long term value of mega event legacies in terms of their impact on the built environment and ability to generate tourism interest and income from visitors.



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IGU2015 – 0714

**An archeology of mega-events? The example of the pilgrimage of Lourdes (France)**

*Oivier LEFEBVRE (France)*

The pilgrimage of Lourdes (France) is an example of a mega-event in the past since it started in... 1858. The similarities with a mega-event of today are many: the importance of Body (faith healings like records are expected and counted), collective trance, organized spectacle, production of space, commercial aspects and advertising, involvement of networks and media (newspapers, train, telegraph) and even... low life (prostitution) ugliness (according to some) and conflicts... It is well documented (Zola, Huysmans...). It is interesting to describe the pilgrimage and its story, not omitting the role of geographical determinism. What are the differences? Devotion has been replaced by the narcissism of spectators and "painless ethics" (Lipovetsky). The mega-event of today generates frustation because we are in transition between the old answer (universalism, like the Christian one ) and the new, a "cosmopolitan realism" (Beck) which is uneasy to build up. It should allow people living together on a peaceful and preserved Planet Earth.



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# Mega Events as drivers of socio-economic development of cities (on the example of the Olympic Games Sochi-2014)

*Mariya GORYACHKO, V.L. BABURIN, P.L. KIRILLOV (Russian Federation)*

According to the concept of cumulative growth, cities have increased ability to generate economic activity and are the drivers of development for the rest of the territory. In this regard, the identification of factors of urban development, assessment of the transformation in them under the influence of the adoption of certain decisions or events is an actual problem of modern economic-geographical research. As such factors transformation and urban development are considered mega events including the Olympic Games. In the modern world, the Olympic Games are not just a sporting event, and multi-layered complex of interrelated activities a large number of actors, aimed at creating a new, better way of life. In this sense, the modern Olympic movement and, especially, in Sochi, is a complex of innovations aimed at changing the appearance of the city, region, country and world through sport, culture and education. The study of the impact of the Olympic and Paralympic Games in Sochi were conducted using a set of indicators to measure and/or estimate the state and dynamics of socio-economic systems before the start of the Olympic project, during implementation and after completion. Generally it is possible to single out the branches experiencing direct and indirect impact. So, the most strongly involved are the ones connected to the infrastructure objects for the Projects. During the process of transformation of the interfaced branches not only the general economic structure of the city is changed, but also intracity distribution and concentration of objects and events. The functional structure of the territory changes. However, finally the main result is the creation of new quality of life of the population in cities



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## Mega-event as a tool in the optimization of urban spatial structure: An entrepreneurial city in action

*Lingyue LI, Roger C. K. CHAN, Ying LUO (China (Hong Kong))*

This study empirically examines the restructuring of urban space in Shanghai Expo, focusing on how the municipal government strategically incorporated this mega-event program into long-term development scheme of Shanghai city. Generally, this presentation discusses how the mega-event strategy has been used to facilitate two paralleling yet complementary entrepreneurial spatial policies: economic restructuring and population decentralization in Shanghai metropolis. Specifically, it critically investigates how the local government acts in two aspects corresponding to the general entrepreneurial policies: industrial relocation and residential resettlement in the Expo. A general analysis reveals that Shanghai's entrepreneurial city building, at the metropolitan level, has long been associated with the optimization of spatial structure into which the Expo was strategically integrated. The Expo-led restructuring indicates that Shanghai municipal government is the key to entrepreneurial city building as it strategically adopts the event to seek support from the national government and to mobilizes lower-level authorities to facilitate the change. Findings of the empirical study suggest that a mega-event, with its high-profile and international significance, would be a powerful tool in the transformation of urban China. It can be strategically used by local government to resolve the conflicts in the restructuring of urban space towards a structural optimization. Therefore, this presentation argues that how much the mega-event can contributes to urban development of host city largely depends on how the local government operates in the actual process of policy implementation and that an integrated approach is significant to achieve designated objective.



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# Mega-events and festivals as indicators of world urban system from a cognitive-cultural dimension

*Roberto DIEZ PISONERO (Spain)*

Today, cities do not compete only by attracting economic flows, but also by particular forms of cultural capital (symbols, images, experiences) that emphasize the identity and cosmopolitan value of the city. The multifunctional character of the global urban system is necessary for city in this sense. Specifically, events and cultural festivals that are often unique citymarketing strategies, can also be used as indicators in statistical analyses to assess the global urban system from the cultural perspective that is contextualized in today's cognitive-cultural society.



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**Mega Sporting Events and Realities of Long-Term Grandeur Impacts on Urban Areas**

*Robert C. SCHNEIDER (USA)*

Mega sporting events change the landscape of urban areas and it is debatable whether the changes are for better or worse. Past mega sporting events lend credence to the notion that the proposed impacts on cities by mega sporting event representatives are broadly optimistic but turn out to be delusions of grandeur. Numerous authors (Costa, 2013; Greene, 2014; Grix & Houlihan, 2014) have pointed out negative long-term outcomes that during the urban impact proposal process seem to be neglected as potential realities that can negatively transform host cities. Host cities of mega sporting events often expect long-term economic windfalls through increases in the likes of tourism, population, and business development. Often such positive impacts do not come to fruition. This presentation will discuss how mega sporting events have shaped urban areas and the extent to which the influence was perceived as positive or negative. Mega sporting events discussed will include selected Olympics games, American football Super Bowls, and World Cup competitions.



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**Mapping the global urban hierarchy beyond economic perspective: events and festivals**

*Roberto DIEZ PISONERO (Spain)*

Today, the global urban hierarchy has changed. Cities do not compete only by attracting economic flows, but also by particular forms of cultural capital (symbols, images, experiences) that emphasize the identity of the city. Events and cultural festivals may be used as indicators in statistical analyses to assess the global urban system from the cultural perspective that is contextualized in today's consumer society.



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## C12.17 Global Change and Human Mobility (Globility)

## C12.34 Population Geography

**Human mobility and latest Census data: new evidences, new insights**

**Chairperson(s):** *Josefina DOMINGUEZ-MUJICA, Etienne PIGUET*

- Inter-provincial Spatial Flow of Rural Population in Henan Province ——Based on the Sixth Nationwide Population Census Data

  *Genghe GAO (China)*

- Transformation of the ethnic structure of the population in St. Petersburg at the end of the XX - begining XXI century

  *D.V. Zhitin, A.I. Krasnov (Russian Federation)*

- Tibetans Immigrants in India: A Demographic profile

  *Rajan BHANDARI (India)*



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# Inter-provincial Spatial Flow of Rural Population in Henan Province ——Based on the Sixth Nationwide Population Census Data

*Genghe GAO (China)*

The rural population flow, as the main part of population flow in China, has a major impact on economic and social development. Based on the sixth nationwide population census data in 2010, the paper focuses on the bi-directional inter-provincial spatial flow of rural population and its influencing factors in Henan province. The results show that: ①The inter-provincial outflow destinations for rural population in Henan province concentrate in the economically developed eastern coastal areas, such as Guangdong province, Zhejiang province, Jiangsu province, Beijing, and Shanghai. Rural population inflow mainly comes from adjacent areas. The outflow population outweighs the inflow population, making Henan province one of the regions where rural population outflow dominates. ②The distance factor has complex effects on inter-provincial population flow. In general, the inter-provincial outflow of rural population concentrates in areas within 1400km from Henan province. However, the outflow quantity is not negatively correlated with the distance. The rural labor force mainly encouraged by economic reasons tends to flow into regions where they can get jobs and certain amounts of incomes. The role of the distance factor is only more important in natural flow. ③ The significant factors influencing inter-provincial rural population net flow include economic aggregate, the net flow stock, the number of non-farm payrolls and the total population. There is a general law of rural population flow, that is rural population flows from the more populated, more economically underdeveloped areas with more employment pressure to more developed areas with more employment opportunities and less population pressure. The economic factor is the dominant factor in rural population flow. Besides, flow inertia is an important mechanism for rural population flow.



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**Transformation of the ethnic structure of the population in St. Petersburg at the end of the XX - begining XXI century**

*D.V. Zhitin, A.I. Krasnov (Russian Federation)*

The ethnic structure of the population of St. Petersburg has undergone significant changes over the past 25 years. As a result of the assimilation, the quantity of population and proportion of a number of several ethnic groups (Ukrainians, Belarusians, Tatars, Jews, etc.) in the city has dropped significantly. At the same time, the influx of migrants from outside Russia led to a significant increase of the number of representatives of the peoples from the South Caucasus and Central Asia. This paper considers the placement of the territory of St. Petersburg representatives of the ten most numerous (after Russians) national diasporas. The analysis is performed on 108 municipalities of St. Petersburg according to the 2010 census. As an indicator of the uneven distribution of population authors developed an ethnic concentration ratio, calculated as the deviation of the proportion of members of a certain ethnic group from the average over the city. The paper shows the differences in the territorial preferences of choosing a place of residence of representatives of different ethnic groups; the correlation coefficients according to territorial concentration of national diasporas were calculated. The authors suggest a typology of municipalities based on the preferences of the most numerous ethnic diasporas of St. Petersburg settlement priorities.



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**Tibetans Immigrants in India: A Demographic profile**

*Rajan BHANDARI (India)*

Today, Tibetans are not only the oldest refugee in India, but, are among the oldest refugee population in the world. Tibetans are living in exile since 1959, after political asylum granted by Government of India. Majority of Tibetans with 80 percent to the total exiled Tibetans have taken shelter in India. While India provided land for settlements, opportunities for education and other services for better survival, Tibetans contribute in economic and social development. The socio-economic development and demography of Tibetans is mainly influenced by different aspects but overwhelmed by the factor of migration even after more than 40 years. Living in Different sized settlements of three types, Tibetans have their distribution in different parts of the country with majority concentration in some settlements. Despite being concentrated in settlements of different types, have large degree of variations in different demographic attributes. The objective of the present study is to focus on demographic scenario with respect to distribution, sex-ratio, age structure, literacy levels and place of birth and economic aspect of Tibetan refugees living in India and to understand the role of migration in controlling different demographic attributes. Information regarding refugee population is quit different from different sources because accurate population is difficult to measure in absence of proper enumerations. In case of Tibetan population regular and authentic enumeration is has been conducted by Tibetan government in exile. Tibetan demographic survey of 1998 and 2008 are major sources for demographic analysis in present study. In addition interviews with Tibetans and Tibetan officials in exile Government were conducted to reach some analysis.



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## C12.20 Commission on the History of Geography

## C12.33 Commission on Political Geography

**Rethinking what (political) geography ought to be: Theories, histories, and practices of geography and geopolitics as instruments of peace 1**

**Chairperson(s):** *Takashi YAMAZAKI, Alexey POSTNIKOV*

- Henri Lefebvre: Differential space and the dialectic of war and peace
  *Rolando ESPINOSA, Keren OROZCO (Mexico)*
- Sharing a Partitioned World. Jean Gottmann on Peace, Cohabitation and a World Community
  *Luca MUSCARÀ (Italy)*
- Géographie politique et géopolitique dans la géographie française au XXe siècle: une affaire d'étiquetage?
  *Olivier ORAIN (France)*
- Exceptionalism in Japanese geopolitics
  *Akihiko TAKAGI (Japan)*
- A Latin American view of the Political and Feminist Geography Knowledge for Peace
  *Verónica IBARRA, Alejandra PEÑA (Mexico)*

**Rethinking what (political) geography ought to be: Theories, histories, and practices of geography and geopolitics as instruments of peace 2**

**Chairperson(s):** *Takashi YAMAZAKI, Alexey Postnikov*

- Geopolitics of peace: Paul Dupuy and Fernand Maurette in Geneva (1924-1948)
  *Federico FERRETTI (Switzerland)*
- The Map That Would Save Europe': Tariff Reform, European Peace and the Politics of Cartographic Display between the Wars
  *Michael HEFFERNAN, Ben THORPE (United Kingdom)*
- Children and the Politics of Hope in the (Re)making of Peace, Development and Democracy in the Southern Philippines
  *Chih Yuan WOON (Singapore)*



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## Henri Lefebvre: Differential space and the dialectic of war and peace

*Rolando ESPINOSA, Keren OROZCO (Mexico)*

According to Rémi Hess —in his Henri Lefebvre et l'aventure du siècle—, Lefebvre achieved, after years of working and putting a hand on his abundant friendships, the goal of building a world network of epistolary exchange that soon became a sort of "international of thought". Between the topics, on which that postal traffic concentrated, stood out the worldness [mondialité] of capitalism. As we know, Lefebvre considered that bourgeois society reproduces everyday an abstract space characterized by its overwhelming violence. Precisely these concerns explain why he was so interested about the problem of world peace. He pondered that somehow we know fight for peace but, at the same time, nobody thinks really about peace. "What is that we call peace? Could we think the peace from the class struggle?" —Lefebvre was wondering at once he was questioning his Marxists friends committed with pacifism—. The industrial development now reached should ensure prosperity, plenty and peace for all. But —Lefebvre said—, once capitalism has projected its contradictions in space, production for peace and production for war become entangled. Peace ceases to be easily distinguishable from war and social space is occupied by pretences of civic peace, consensus, or the reign of non-violence. So war is no longer declared, but first of all it is materially made —through technology, architecture, city, space and practical relations in everyday life—. However, peace should be made in the same way —even struggling for emancipation— and this is the central point of Lefebvre's theory of social production of differential space. The aim of this presentation is to explain how Lefebvre conceives this paradox of our time.



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**Sharing a Partitioned World. Jean Gottmann on Peace, Cohabitation and a World Community**

*Luca MUSCARÀ (Italy)*

Peace is a political challenge, and Jean Gottmann (1915-1994), a refugee and political geographer affected by two World Wars, paid due attention to the problem of World Peace. In his 1950s writings, he saw Cohabitation, a product of population densities, at the origin of Politics itself. Therefore, the problem of Peace is related to Cohabitation. In order to succeed, Cohabitation requires a certain degree of Solidarity, of Social Cohesion among inhabitants, an established system of relations, and a certain social organization. As densities continue to increase, and movement continue to expand the range of cohabitation to the scale of the whole World, the problem of World Peace would require both a political organization and a political Community at the same scale. In his last public talk, in Tokyo, Jean Gottmann wrote that a World Community would only succeed if based on tolerance of different peoples, cultures and religions, therefore on the coexistence of different identities, each with its respective territorial mooring and territorial projections, rather than on the creation of a unified identity and culture. Mankind resists homogenization and since territory is a necessary mediation to provide a certain degree of separation between the different communities, the process of political regionalization of geographic space is inevitable, but in turn it also affects cohabitation, and therefore also the possibilities of a political organization at this scale to foster World Peace. How would today's political geographers benefit from these ideas in view of today's challenges to world peace ? Which new discontinuities have meanwhile intervened ?



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# Géographie politique et géopolitique dans la géographie française au XXe siècle: une affaire d'étiquetage?

*Olivier ORAIN (France)*

Le but de cette communication est d'explorer les différents étiquetages, "géographie politique", "géopolitique", "géographie du pouvoir", etc., à travers lesquels les géographes français (ou francophones européens) du XXe siècle ont essayé de donner sens à un projet fondant une géographie (du) politique. Centrée sur les textes programmatiques qui ont jalonné l'histoire disciplinaire et appuyée sur des interrogations sémantiques et épistémologiques, cette contribution voudrait mettre l'accent sur les difficultés de la géographie française à penser les singularités d'un objet - "le" ou "la" politique - assez étranger aux différents paradigmes dominants dans la géographie francophone. Durant le long règne de l'école française de géographie, ces tentatives sont demeurées en position marginale (Jacques Ancel, Jean Gottmann). Ultérieurement, les tentatives d'adaptation du paradigme classique (la "géopolitique" à la façon d'Yves Lacoste) ou de refondation théorique par importation de normes extérieures (la "géographie du pouvoir" de Claude Raffestin), se sont heurtées non plus au problème de marginalité ou d'illégitimité que pouvait susciter de telles entreprises, mais à un enjeu d'élucidation de leur heuristique propre, avec des "solutions" extrêmement dissemblables. Bénéficiant de la vogue des discours géopolitiques, la plupart des géographies politiques de langue française peinent à dépasser l'examen in situ de situations concrètes (conflits territoriaux, dynamiques frontalières, relations entre Etats et collectivités territoriales) pour tenter de fonder en généralité une approche géographique des questions politiques, sinon par l'invocation de la variété des échelles prises en compte.



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## Exceptionalism in Japanese geopolitics

*Akihiko TAKAGI (Japan)*

I presented a paper with a title called "Japanese wartime geopolitics and exceptionalism in the post war era" at IGU Cracow Regional Conference in 2014. This paper is a sequel of it. Geopolitics revived in 1980s. Since then, many books and articles of geopolitics have been published in the world. Japan also has witnessed many books on geopolitics. However, it never led to the revival of geopolitics in geography. Although some geographers investigated the wartime geopolitics from the history of geographical thought, most of Japanese geographers never took a growing interest in geopolitical studies on international politics just like western counterpart. There are two main reasons for this situation. One is that Japanese geographers are still suffering from the aftereffects of engaging geopolitics during the war time. The other is that Marxism has been dominant in the academic and publishing circles in Japan. Geopolitical books were considered as "the smart logic" or "the evil logic" and never welcomed into the academic world. The situation has not changed in the 21st century. Japanese geography must overcome this exceptionalism. To do so, two issues should be considered. One is aspiring peace or pacifism in Japanese diplomacy. The other is middle power diplomacy which means the great economic power with the pacifism. I will speak on these issues in detail.



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# A Latin American view of the Political and Feminist Geography Knowledge for Peace

*Verónica IBARRA, Alejandra PEÑA (Mexico)*

From other scientific disciplines, the Political Geography has been criticized for presenting a colonialist and a conservative perspective, and the geographic knowledge has been labelled as warlike. Without denying that one part of the geography makers has held these positions, it is necessary to recognize that on other perspectives of the discipline, there have been libertarian positons since the XIX century, with representatives such as Élisée Reclus and Priot Kropotkin, among the most recognized. In the XX century, as the World wars were carried out, the Political Geography formulated debates of the highest importance, taking pacifist academic stands, at the same time that new theoretical frames that allowed the discussion of these topics were investigated. In the same way, when the western feminist movement was incorporated at the universities in the fifties –questioning the social, political and economic conditions of women– the Political Geography developed analytical categories (Marxists, humanists and feminists) that contributed to the construction of a libertarian Geography that made injustices, violence and inequalities visible, in favor of a better world in which peace is one of the most valuable principles. The objective of this work is to show the libertarian tradition of the Political Geography in Latin America and its consolidation since the seventies of the XX century, with the academic debates between the Marxists and feminists geographies.



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**Geopolitics of peace: Paul Dupuy and Fernand Maurette in Geneva (1924-1948)**

*Federico FERRETTI (Switzerland)*

The French Geographers Paul Dupuy (1856-1948) and Fernand Maurette (1879-1937) were the protagonists of a remarkable experience of international scientific networking for political, social and educational purposes. Maurette, who married Dupuy's daughter, Marie-Thérèse (1890-1989), became involved with his friend Albert Thomas in the experience of the Geneva Bureau International du Travail/International Labour Office after the First World War. Even if this work implied to renounce his university appointments, Maurette continued his engagement as a geographer, traveling for his institution and elaborating one of the first geographical approaches to economic globalization; he was also the author of the Géographie Universelle's volume consecrated to Sub-Saharan Africa (1938). When Maurette moved in Geneva, Marie-Thérèse and Paul Dupuy were called to organize the Geneva International School, where they experimented a bilingual and mixed teaching, inspired by Adolphe Ferrière's Education nouvelle, which included disciplines like World History and International culture, aiming explicitly to train pupils in mutual understanding and tolerance. In their work, their pacifist political aims were reinforced by considerations that we can call today 'geopolitics'. Which was the working of their teaching? Which was the role of geography in the Maurette-Dupuy networking in the milieus of the Geneva League of Nations in the interwar period? As these intellectuals are little known and few works exist on them, I try to clarify these topics drawing on primary sources, namely the rich Dupuy and Maurette archives held in Geneva, which can provide significant answers and open new lines of research on the topic of peace geographies.



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# The Map That Would Save Europe': Tariff Reform, European Peace and the Politics of Cartographic Display between the Wars

*Michael HEFFERNAN, Ben THORPE (United Kingdom)*

In the late 1920s, Sir Clive Morrison-Bell, a little known British Conservative Member of Parliament, produced a series of large three-dimensional cartographic models of Europe on which international borders were depicted as actual physical walls, the varying heights of which were calculated on the basis of the tariff restrictions of each state. These models were prominently displayed at international conferences in several European and American cities during the depression, at a time when many nations were implementing programs of economic autarky and re-armament in response to the gathering economic and political crisis. Morrison-Bell's models generated widespread debate about the potential of tariff reform to secure European peace and facilitate European unity. Although the campaign for a European customs union between the wars has received some attention, the significance of visual and cartographic representations for these wider economic and geopolitical debates has been entirely overlooked (Stirk 1989; Boyce 1989). This paper aims to address this by providing a critical account of the production, circulation and display of Morrison-Bell's Tariff Walls Map during the late 1920s and early 1930s, focusing on how this striking cartographic model of the continent was seen and used by the European peace movement and by advocates of European unity. The paper will also examine Morrison-Bell's self-image as a campaigning 'citizen-geographer' who saw maps as important pedagogic, visual and haptic alternatives to verbal and textual political debate.



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**Children and the Politics of Hope in the (Re)making of Peace, Development and Democracy in the Southern Philippines**

*Chih Yuan WOON (Singapore)*

Responding to calls for greater attention to be paid to the 'peoples' involved in the (re)making of peaceful geographies, this paper focuses on the agency of children and their roles in shaping the trajectories and outcomes of peace. Geographers have increasingly located the political in children's spatial practices—their efforts to actively negotiate broader structures, relations and identifications through the everyday circumstances in which they are positioned. Yet such works bequeath scant attention to (post)conflict societies and the ways in which children's everyday enactment of politics can help to harness transformative possibilities. Drawing on the case study of Mindanao (Southern Philippines) which has been embroiled in long term violence arising from secessionist and 'terrorism' concerns, I concur with Elwood and Mitchell's (2012) observation that children's cartographic representations and their dialogues of the everyday can constitute a significant (yet under-examined) space for their politics and their formation as political actors. Specifically, by methodologically engaging with children's narratives that are articulated around their vision maps of peace, I argue that these drawings embody an anticipatory geopolitics of hope for futures in which everyday experiences of peace are connected to broader goals of development and social justice. But rather than viewing such embodied practices as having no wider political implications, I simultaneously showcase the efforts of one Mindanao-based NGO, Balay Mindanaw, in actively politicizing these children's hopeful imag(in)ings in order to sway local communities' decisions to engage in peace. This in turn opens up opportunities for these communities to confront and negotiate the meanings of peace at the critical interface of development, democracy and power as well as devise appropriate strategies to stamp out the reproduction of violence across generations.



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## C12.35. Sustainability in Rural Systems

## C12.30 Mediterranean Basin

**Strategies to create Health, Welth and Happiness in the Rural Areas**

**Chairperson(s):** *Ana FIRMINO, Kim DOO-CHUL -, Maria PARADISO*

- Be Young and "happy" in the periurban edges of the Great Paris
  *Catherine DIDIER-FEVRE (France)*
- Accessible tourism: an opportunity for Health, Wealth and Happiness
  *Ana FIRMINO (Portugal)*
- When Tradition and Culture do not match with Sustainability
  *Ana FIRMINO (Portugal)*



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**Be Young and "happy" in the periurban edges of the Great Paris**

*Catherine DIDIER-FEVRE (France)*

The success story of the song Happy by Pharell Williams had not only arrived to the big cities but also to little villages such as Villeneuve-sur-Yonne in Burgundy. A video (https://www.youtube.com/watch?v=Q9Iutlu6zSM) shows how people meet wealth and happiness in their daily life; this town is located in one of the periurban edges of the Great Paris. In these places where populations are less numerous than in other, and where public transportation seem less developed than in the areas closed Paris, the young generation (15 to 20 years old) would like to live like young very urbans: going out, going to parties, meeting other young people in the night clubs, meeting their friends as they want, practising sport and cultural leisures, and moving anywhere without asking their parents to drive them. The local communities and the groups of municipalities are organized to offer some initiatives to supporting their young adults, such as 'Maisons de Jeunes', leisures, modern systems of transportation –for example the use of electric cars – all of that at a cheaper cost. The system of local associations is associating different partners such as the young people who are becoming major actors of their own life. Many surveys and interviews between these young people and officials such as mayors, educators allow to shape new public policies about the way of life of the young people across le Great Paris area, the so-called 'happiness geography'.



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# Accessible tourism: an opportunity for Health, Wealth and Happiness

*Ana FIRMINO (Portugal)*

Accessible tourism can represent types of tourism that are accessible by people with less income. However in this paper it is meant to represent a tourism that targets people with some kind of disability, who need infrastructures prepared to deal with their special needs. According to estimates of the European Union there are about 650 million people in the world with disabilities. Together with their families, they represent approximately 2 billion people who are directly affected by disability, i.e. nearly a third of the world's population. In the European Union it is estimated that by 2050 the number of people over 65 will be 3 times what it was in 2003, and the over 80's will be 5 times greater in number. This represents an interesting market for accessible tourism in the future. A new paradigm is emerging, as a result of a higher level of awareness. This is visible in the European policies aiming at funding projects dealing with tourism in the framework of social inclusion, such as the European Social Fund. Portugal is a touristic country; however, in respect of accessible tourism, there is much to be done, namely to launch a network allowing the units to cooperate among themselves and link with social farms, where the infrastructures already exist. Around 50% of people with disability would travel more if they could be sure that accessible facilities would be available and we have the potential to receive them. This paper focuses on examples of units in Portugal that are specialized in accessible tourism and discusses the role that these can play to contribute to a better health among the visitors, create wealth in the community, namely through an enlarged and specialized job offer and thus be a catalyst for happiness.



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IGU2015 – 1742

**When Tradition and Culture do not match with Sustainability**

*Ana FIRMINO (Portugal)*

At a first sight the impacts that the UNESCO intangible cultural heritage award may represent to the protection of the Mediterranean diet may appear solely positive. We may recall the importance of diet for human health, the know-how associated with the preparation of the dishes, food sovereignty, general interest in the local gastronomy that has been attracting both national and foreign tourists to counter the cycle with the globalization trend for fast food, amongst others. However there are also some risks, namely those associated with an increase in demand, that may endanger sustainable production and consumption of some items such as codfish, which is an important element in traditional Portuguese cuisine, representing more than a third of all fish consumed in Portugal. The Portuguese are the largest per capita consumer of codfish in the world, consuming about 60,000 tons of cod per year, 90% of which is sold salted and dried. In spite of the the threat to the species (90% of the fish stocks such as thon, codfish and swordfish are exhausted) the importance of codfish in the Portuguese gastronomy justifies the endeavor of the Portuguese government to increase the quota (+ 25% in 2014, after an increase of 24% in 2013). What to do? This paper will address the responsibility of consumers, who should avoid eating the species mentioned in the red list and change the consumption pattern (leek for instance is used to replace codfish in vegetarian dishes) so that the stocks of codfish do not "dry up" completely.



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# C12.36 Toponymy jointly with International Cartographic Association

## Place-name Study and Geographical Research 1

**Chairperson(s):** *Cosimo PALAGIANO, Andrey HERZEN*

- The cities of Americas in Modern Times
  *Cosimo PALAGIANO (Italy)*
- The Role of Hydronyms in Ethnohistorical Studies
  *Ruth AGHEYEVA (Russian Federation)*
- Near-identical twin toponyms along borders. How do they reflect the linguistic and political past?
  *Riemer REINSMA (The Netherlands)*
- Mapping geographical name evolution in Southern Africa
  *Peter RAPER (South Africa)*
- Spatial-geographical analysis of place names in the area of Russian Sami inhabitance
  *Natalia ALEXEENKO,Svetlana MIKHEEVA(Russia)*

## Place-name Study and Geographical Research 2

**Chairperson(s):** *Cosimo PALAGIANO, Andrey HERZEN*

- The basic principles of name-giving in Moscow
  *Tatiana SOKOLOVA (Russian Federation)*
- Odonyms: Logics and naming features of street names in France
  *Dominique* BADARIOTTI (Russian Federation)
- Name and the City: Exploring national narrative in Beirut-as-text
  *Jack KEILO (France)*
- Russian-language forms of names of geographic features located in Poland
  *Tomasz WITES (Poland)*
- Geography of toponyms Moldav- / Moldov-
  *Andrey HERZEN (Russian Federation)*



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## POSTER EXIBITION

- The Toponymy of the Elbrus Mountain Region (Central Caucasus)
  *Alim ZALIKHANOV (Russian Federation)*



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**The cities of Americas in Modern Times**

*Cosimo PALAGIANO (Italy)*

After the discovery of Americas the colonizers founded many cities. The names of these cities derive from the places of origin of the founders, who were especially English, Spanish, French, Portuguese. Other few people founded some cities, which today disappeared, with a few cases. For example, Italian settlers founded the cities of Nuevo Torino close to Santa Fe in Argentina and New Naples close to Atlantic City in the United States of America. I did not find the location of New Naples, while Nuevo Torino lost largely its Italian identity. Nova Trento (Neue Trient in German), founded by Italian settlers during the Austrian Empire in the state of Santa Catarina in Brazil, is now a city of about 12,000 inhabitants, who keep their Italian identity. The place names in the Americas can refer to: (i) Saints and religious bodies; (ii) Politicians and commanders; (iii) Kings; (iv) Explorers; (v) Indigenous peoples, settlements and languages; (vi) European cities; (vii) A State; (viii) The date of foundation; (ix) Morphological position; (x) A concept; (xi) Economical production; (xii) Uncertain meaning. Very often the indigenous names changed or were distorted in the new ones.



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## The Role of Hydronyms in Ethnohistorical Studies

*Ruth AGHEYEVA (Russian Federation)*

Ancient hydronyms play a large part in ethnohistorical studies. The linguistic analysis of hydronyms may indicate the right way to the conclusions made by archaeologists and ethnologists, as far as settlements of ethnic communities or migrations of the population are concerned. E.g. the investigation of the Novgorod and Pskov regional hydronyms in the North-West Russia showed that not only Finno-Ugrians, but also some Baltic tribes inhabited this land before the arrival of Eastern Slavic tribes from Central Europe starting from the 5th century A.C.



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**Near-identical twin toponyms along borders. How do they reflect the linguistic and political past?**

*Riemer REINSMA (The Netherlands)*

The Netherlands (hereafter: NL) shares its national border with Belgium (hereafter: B) and Germany (D). Alongside the border are toponyms which are either identical (like Lemiers: NL, also D), or near-identical, like Clinge (NL)/ De Klinge (B) or Aamsveen (NL)/ Amtsvenn (D). The names concerned denote adjoining settlements and regions. Name pairs like Aamsveen/ Amtsvenn, differring in pronunciation, are comparable to name pairs like Görlitz/ Zgorzelec, on the German-Polish border. The Belgian border is not a linguistic one; Dutch is the standard language on both sides of it (apart from a small Belgian region where French is the standard language, the local dialect on both sides being High-German). The German border, however, divides two standard languages, while there used to be a continuum on the dialectal level until about 1940. Since C 19, both the Dutch and the German standard language have won ground at the expense of the dialect, due to the increased influence of the national administrations. This paper focuses on twin names which show small differences. For example, some differences are (partly) orthographic (Clinge (NL)/De Klinge (B)), others imply (partial) translations and folk etymological adaptations (Aamsveen (NL)/ Amtsvenn (D)) or relate to morphological differences: Baarle Hertog (B) versus Baarle Nassau (NL) (comparable to Bosanski Brod (Bosnia) versus Slavonski Brod (Slavonia)). The paper presents an impetus to a typology and tries to explain the differences by relating them (with respect to the German border) to increased influence of the German standard language and orthography (and, by consequence, spelling pronunciation), and, with regard to the Belgian border, to different spelling regulations.



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## Mapping geographical name evolution in Southern Africa

*Peter RAPER (South Africa)*

Succesive habitation of Southern Africa by a wide variety of ethnic groups, and language contact between these peoples over thousands of years, has resulted in a landscape comprising geographical names from Bushman (San), Khoikhoi, Bantu, European and Asian languages. These names display intra- and interlinguistic development that includes phonological and orthographic adaptation, translation, semantic loss and reinterpretation, and the occurrence of allonyms for many geographical and cultural features in different language. Of these allonyms some are still in use, some are obsolete, some have been recorded, and some can only be revealed through stringent research and require reconstruction. Research over the past decade is revealing a hitherto unrecognized substructure of Stone Age hunter-gatherer influence. Taking cognizance of United Nations resolutions recommending the preservation of indigenous toponyms as part of the intangible heritage of people, and of similar stipulations of the Constitution of the Republic of South Africa. this paper discusses the potential, sources, methods and challenges of identifying, restoring and mapping Bushman toponyms with Bantu and European cognates. From historical and modern maps and archival and other sources a cartographic representation can reveal and visualize synchronic and diachronic allonyms for geographic features. A layered digital cartographic model is envisaged that will display the toponymic evolution involved.



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## Spatial-geographical analysis of place names in the area of Russian Sami inhabitance

*Natalia ALEXEENKO,Svetlana MIKHEEVA(Russia)*

The Kola Peninsula is the area where Sami, the indigenous ethnic group of Northern Europe speaking a specific Finno-Ugric language, live. Place names are of particular informational value for studying various aspects of the language of oral people to which Sami belonged in the past. Field research was carried out in the towns of Apatity and Kirovsk, Revda, Lovozyory and Krasnoshchelye settlements and the Lapland Biosphere Reserve. More than 300 place names were identified within the studied territory. Two maps, i.e. for the Lovozersky massif and the Lapland Biosphere Reserve, are the main result of the study. Two large groups of place names are those of the Sami and the Russian origin; several place names have the Komi origin. A number of the Sami place names cannot be translated now, for example, the Leuney river, the Sasnyun mountain, etc., because the linguistic knowledge has been lost. According to the elaborated typology the Sami place names are of several groups: landscape (Kupis-yok - the river with marshy banks), zoological (Konya river - the deer river) or related to the pagan cult (Seyd-yok - the sacred river). Derivatives from the own names are rather numerous among the Russian place names, e.g. the Kreps Mount (named after G.M. Kreps, the founder of the Lapland Biosphere Reserve), the Kokorinsky stream (named after L.G. Kokorin, a former forester of the Lapland Biosphere Reserve). Despite the 120-year-long history of the Komi-Izhma people living in Lapland no Komi language place names survive in the area. Questioning of the elder inhabitants, ethnic Komi, has revealed that many Russian place names are translations of the Komi language ones used in the areas of their compact living and nature management.



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**The basic principles of name-giving in Moscow**

*Tatiana SOKOLOVA (Russian Federation)*

Moscow Urban Toponymy has been evolving through centuries (since the 12th to the 21st), influenced by external, extra-linguistic factors: geographical, historical, economic, political, social, ideological (local topography, political power and forms of property, official ideologies and doctrines, religious beliefs, urban lifestyles, cross-ethnic contacts, etc). A number of name-giving principles in Moscow have appeared as the result of natural naming, e.g. after feature name, after church name, after former land or house owners, after rings and radial roads (Old Moscow has a ring and radial structure, the Kremlin is the oldest part of Moscow and the place all Moscow roads lead to). Since 1922 the Committee for the Naming of Moscow streets has worked hard in normalization of urban toponyms and created a number of name-giving principles based on artificial naming, e.g. geographic principle (an urban name reflects the direction to a famous geographic area – Kolskaya street (from Kola Peninsula), thematic principle (the creation of systems of names under a certain theme, e.g. of space exploration). The commemorative principle takes a dominant lead in modern Moscow naiming, but at the same time it is the most controversial one. In 2012 the territory of Moscow increased more than twofold. Thus, there are many problems in the naming of new areas of Moscow and we can solve them only gradually, taking into account the interests of the people of connected settlements, but at the same time preventing the destruction of the existing system of urban toponyms in old Moscow.



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**Odonyms: Logics and naming features of street names in France**

*Dominique* BADARIOTTI (Russian Federation)

Our presentation focuses on odonymy - « odonymes » in French - which is a part of urban toponymy specialised in street names onomastics. Street names were not implemented at random in our cities, but according to a logic of naming both historical and geographical. In France, five major appellation periods can be distinguished, each caracterized by a specific heritage based on different principles: the Middle Ages, the Enlightenment, the French Revolution, the Empire and the Present. The naming logics observed during these five periods are present on the entire territory, however, with significant variations from Paris to the province. They are essentially characterized by two main aspects: 1/ a strong presence of local names and 2/ an historical increasing of the politicization of street names. Moreover, at an intra-urban level, there is a remarkable close relationship between the geography of a city and the geography of its odonyms.



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## Name and the City: Exploring national narrative in Beirut-as-text

*Jack KEILO (France)*

Being the capital of Lebanon, Beirut presents itself as a "bridge" between East and West (implying "Islam" and "Christendom") thus being external to both and following "positive neutrality". The National Pact of 1943, depicted as a gentlemen's agreement between Christian and Muslim leaders, affirms the non-alignment of Lebanon by its famous Non à l'Occident et Non à l'Orient. In this paper we assess this "neutrality" via the reading of commemorative place names in the Centre-Ville Beirut, arguably the economic heart and the political centre of the city and of the country. National Pact signatories, Muslims and Christians, are commemorated in street names of Centre-Ville Beirut, besides the names of British and French army men who shaped the Grand Liban (e.g. Gouraud, Weygand and Allenby). Commemorating both Mandatory Powers and fathers of Lebanese independence gives Beirut a unique flavour of "buffer" between "East" and "West" where colonial military power can continue to exist peacefully with its ideological and political opponents. In another aspect, Beirut's city-text can reflect conflicts over the urban space: place-names are integral parts of place-identities. In the post-civil-war reconstructed Centre-Ville is there a real consensus on the roles of Allenby and Gouraud in building the Lebanese State? Many questions would lead to the conclusion that Beirut-as-text is, too, a field of conflict over the urban space and its identity. As a result Beirut-as-text (as presented officially and on the maps) is friendly to both "East" and "West" and claiming both in its own narrative of itself, told in place names: thus it is not a "no man's land" but rather an "all man's land". Yet this "friendship coined in toponyms" reflects the deep identity crisis that Lebanon has had since its foundation in 1920.



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**Russian-language forms of names of geographic features located in Poland**

*Tomasz WITES (Poland)*

This presentation concerns Russian-language names of geographic features located in Poland. The impact of the language of a neighbouring country seems undeniable in this respect, but the issue is complex on account of differing alphabets, as well as historical conditions determining relations between two states. This study attempts to organise the denomination bearing in mind rules of word stress and of grammatical gender in the case of toponyms or parts thereof. For the purpose of analysis Russian names of geographic features in Poland shall be divided into categories. The first group shall consist of names of countries, selected territorial or administrative units and historical regions. The second group will include landforms, water features, other natural features and protected areas, and the third group - other objects. When discussing the legitimacy of using specific names of Polish geographic features in Russian, citing geographic criteria and cartographic sources seems of key importance. A change of existing names is more and more often justified on the grounds of how frequently a form appears in online databases. The arbitrariness of such a decision results in a growing discrepancy between what is used in traditional cartographic sources and in modern data transmission mediums. This study will assess whether it is justifiable to recommend other name forms. Indicating an optimal solution to this issue will not only help establish a compromise between the applied and proposed terminology, but will also allow to limit name-related confusion.



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## Geography of toponyms Moldav- / Moldov-

*Andrey HERZEN (Russian Federation)*

One of the most important and interesting scientific problems of Moldavian history, geography and linguistics for at least five centuries, remains the question of origin of the name of the country and the people - Moldavia and Moldavians. Despite the exceptional importance of the problem and the long-term interest of researchers, scientists still have not managed to solve this toponymic riddle and reach a consensus. Toponymic research certainly has to base on a comprehensive theoretical and analytical approach covering geographical, historical and linguistic methods. The most important approaches for such a comprehensive coverage is a cartographic method and, of course, the analysis of the studied geography names. At least 80 place-names with the root Mold-, now existing or previously recorded are discovered in the world today. The main part of them are found in Central Europe - from the Alps to the Black Sea. The specially prepared map of place-names with the basics of the Moldav- / Moldov-, where we see a very widespread of this toponymic base and at the same time its clear geographical affinity to the Hercynian-Carpathian-Balkan areal. In Central Europe, several groups found areas where there are place names with the basics on the Moldav- / Moldov-. Cognate toponyms form several clusters included in three large regions - Western (covering Germany, Czechia, Austria, Slovakia and Hungary), central (Moldavia, southwest of Ukraine, northwest of Romania) and southern (south of Romania, east of Serbia, west of Bulgaria) toponymic areas. Six clusters identified: Saxon, Bohemian, Slovak-Hungarian, proper Moldavian, Wallachian and the Danube-Balkan.



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## The Toponymy of the Elbrus Mountain Region (Central Caucasus)

*Alim ZALIKHANOV (Russian Federation)*

The area around the Elbrus Mountain is the orographically elevated territory in Russia and the whole of Europe. Its height is 5642 meters above the sea level, and many other mountain peaks are 5000 meters above the sea level. It has a huge number of glaciers covering a huge area. In addition to many interesting geographical features, the North Caucasus itself raises considerable interest in terms of history and archeology. It is one of the most ancient world's cultural centers of the early Bronze Age and it can be compared to the early civilizations of Egypt and Shumerian state. Numerous findings of bronze, gold, and silver artefacts found in huge earth mounds - kurgans erected four – five thousand years B.C. can be compared in terms of their size and importance to the Egyptian pyramids, well-known all over the world. This region has seen the civilizations of very many peoples: Scythians, Sarmatians, Huns, Alans, Aesirs, Khazars. These peoples and especially the Bulgars whose traces had been reflected in the ancient Syrian and Armenian manuscripts that go as back as the 2th century B.C. have given origin to the modern Balkar people. The Balkar people have many relict features in their material and spiritual culture that go back to the ancient peoples. Many old words of the disappeared peoples have been retained by the language, especially in the toponymy. Some geographical areas have about 30 to 40 percent of such relict toponym words. The studies of such rich toponymy of the region is very promising and is of great interest for research in general.



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# THEMATIC SESSIONS

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# Aral Sea Syndrome – Case Studies and Consequences

**Chairperson(s):** *Christian OPP, Zhanna KUZMINA*

- The future of Aral Sea: Several Scenarios

  *Philip MICKLIN (United States of America)*

- Aeolian dust deposition in the Aral Sea region – a spatial and temporal analysis of an ecological crisis

  *Michael GROLL, Christian OPP, Tom LOTZ, Ilkhom ASLANOV, Natalyia VERESHAGINA (Germany)*

- Linking Water Scarcity, Riparian Vegetation and Aeolian Sediment Dynamics at the Lower Reaches of the Tarim River, NW China

  *Florian BETZ, Bernd CYFFKA, Martin KUBA (Germany)*

- Diseases of the population in the lower reaches of the Syr-Darya River and the Aral Sea crisis

  *Malik BURLIBAYEV, D. BURLIBAYEVA (Kazakhstan)*

**POSTER EXIBITION**

- Environmental Changes and Dust Emission in the Dried Bottom of the Aral Sea

  *L. ORLOVSKY, L. SPIVAK, R. INDOITU, G. KOZHORIDZE, M. BATYRBAEVA, I. VITKOVSKAYA, N. ORLOVSKY (Israel)*

- Monitoring locust habitats in the Amudarya River delta, Uzbekistan, using satellite remote sensing

  *Fabian LÖW, Alexandre LATCHININSKY (Germany)*



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## The future of Aral Sea: Several Scenarios

*Philip MICKLIN (United States of America)*

The Aral Sea in 1960 was a huge brackish water lake (4th in the world in size of surface area) lying among the deserts of Central Asia. The sea supported a major fishery and functioned as a key regional transportation route. Since 1960, the Aral has undergone rapid desiccation and salinization, overwhelmingly the result of unsustainable expansion of irrigation that dried up its two tributary rivers the Amudarya and Syrdarya and severely damaged the deltas of these rivers. The desiccation of the Aral Sea has had severe negative impacts, including, among others, the demise of commercial fishing, devastation of the floral and faunal biodiversity of the native ecosystems of the Syr and Amu deltas, and increased frequency and strength of salt/dust storms. However, efforts have been and are being made to partially restore the sea's hydrology along with its biodiversity, and economic value. The northern part of the Aral has been separated from the southern part by a dike and dam, leading to a level rise and lower salinity. This allowed native fishes to return from the rivers and revitalized the fishing industry. Partial preservation of the Western Basin of the southern Aral Sea may be possible, but these plans need much further environmental and economic analysis. This paper, mainly utilizing hydrologic and other data as input to Excel based hydrologic models, examines the current efforts to restore the Aral and looks at several future scenarios of the Sea.



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# Aeolian dust deposition in the Aral Sea region – a spatial and temporal analysis of an ecological crisis

*Michael GROLL, Christian OPP, Tom LOTZ, Ilkhom ASLANOV, Natalyia VERESHAGINA (Germany)*

In combination with the desiccation of the Aral Sea and the formation of the Aral Kum, the dry sea bed became a new source for dust and sand storms. Due to the highly continental climate and the effects of the global climate change in the region, increasing air pressure differences lead to an increasing frequency of high intensity wind events. The resulting aeolian dust movements can be tracked and split into short and long distance transfers using remote sensing approaches, but hard data about the spatial and temporal distribution of the dust deposition requires excessive ground research and thus is scarce. Therefore, we have analyzed the passive dust deposition data from 23 meteorological stations and assessed the spatial and temporal transfer patterns within several transects from the banks of the former Aral Sea in eastern and southern directions covering parts of Kazakhstan, Uzbekistan and Turkmenistan. Dust was collected on a monthly base as well as during specific dust storm events between 2003 and 2012 in the framework of three research projects for both long-term and event based deposition data. Dust transfer in southern direction was the most important trajectory and the newly formed Aral Kum proved to be an important source region for aeolian dust (besides the natural deserts Kyzyl Kum and Kara Kum). Stations close to these source regions frequently showed deposition rates exceeding international thresholds, resulting in possible negative effects on human and livestock health while the mineralogical and chemical composition of the deposited material influences the arable land in this arid region. This presentation will summarize the most important findings from the three research projects and discuss measures to reduce the wind erosion in the Aral Kum.



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# Linking Water Scarcity, Riparian Vegetation and Aeolian Sediment Dynamics at the Lower Reaches of the Tarim River, NW China

*Florian BETZ, Bernd CYFFKA, Martin KUBA (Germany)*

One valuable example for the Aral Sea Syndrome is the Tarim Basin in Northwest China. This basin is characterized by a hyper arid climate with precipitation of less than 50 mm p.a. and a potential evapotranspiration of about 3000 mm p.a.. Consequently, water supply for agriculture as well as natural ecosystems only originates from the Tarim River fed by melting water from the Tian Shan Mountains. In the 1950s, an era of increasing cotton farming at the middle and upper reaches of the Tarim started, new settlers came to the region and river oasis began to grow. To satisfy the increasing water demand of agriculture, reservoirs and dams were constructed. From the 1970s onwards the lower reaches of the Tarim River have fallen dry. Since 2000, the Chinese authorities have been transferring so called "ecological water" to the lower reaches to stop the obvious environmental degradation. Natural riparian vegetation forms an important shelter against sand and dust storms and protects the National Highway 218 running along the Tarim against drifting sand. This protection function is considered as the main ecosystem service in this area. This contribution investigates the capacity of natural vegetation to control windblown sand and dust in the light of water scarcity and environmental degradation of natural riparian ecosystems. Results from a modelling approach as well as observations from four years of field work can demonstrate that natural vegetation is a highly effective control of windblown sediment in present time. Furthermore, we highlight the future challenge of sustainable development of natural riparian ecosystems and their services and point on chances and limits of their development under current management strategies.



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**Diseases of the population in the lower reaches of the Syr-Darya River and the Aral Sea crisis**

*Malik BURLIBAYEV, D. BURLIBAYEVA (Kazakhstan)*

Environmental degradation in the Syrdarya basin is inextricably linked to pollution of air, soil and water bodies with products of agricultural, industrial and domestic activities. Since water for drinking purposes is taken from open water sources, which is the Syr Darya river, it should be noted that all impurities contained in the surface waters to a greater or lesser extent, will eventually be found not only in aquatic ecosystems, but in the urban water supply network too. Much of the pollution discharged with wastewater within the Republic of Uzbekistan and the Republic of Kazakhstan is eventually returned to people when water is taken for domestic purposes in Kyzylorda and the Kyzylorda region.

Therefore, environmental pollution has a direct impact on human health. The diseases analyzed below are caused primarily by untreated and inadequately treated wastewater discharged by the industry, agriculture and utility facilities into the Syr Darya river, from where the water is taken for drinking purposes of settlements, Kyzylorda region and Kyzylorda city. At the same time it should be noted that there are natural foci of pathogens in air, soil, water, flora and fauna in the Syrdarya river basin.

In some parts of the basin there are diseases caused by trace elements deficiency, excess or disbalance in the water. It is no secret that most of the population diseases are primarily associated with poor process of drinking water preparation and secondary pollution of water during its processing and transportation in distribution systems.

However, the main cause of environmental degradation and increased rates of cancer and other diseases associated with the use of water in residential areas should be referred to untreated and insufficiently treated waste water discharged into the Syrdarya river from industrial, agricultural and municipal facilities. These drains carry large quantities of mineral and organic substances (contaminants), which influence on the environmental systems, to say the least, is negative.

In the Syr Darya Basin most of its water is used for the following [1-12]:

1) Housing, utilities, drinking and community needs;
2) Fisheries;
3) Industrial;
4) Agriculture;
5) Recreational use of coastal zones.

The most stringent water quality requirements are applied to water users of category 1 and category 2. Less stringent requirements are applied to agricultural and industrial water user categories.

The main indicators of water quality, which describe the content of harmful substances are the maximum permissible concentrations of pollutants (MPC). The MPC is the maximum concentration of pollutants per unit of volume or mass of a biological object, when the impurities are not harmful to the human body and other living organisms and the environment. The main purpose of the water quality standardization is to prevent its harmful effects on the human body, ie, on the health of population and the environment.



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Water belongs to the main components of life support. Man uses water throughout his life, so it can be attributed to a permanent factor of chronic influence. Therefore there are special requirements for the quality of drinking water.

The Syr Darya River is the main source of centralized water supply for a number of settlements in the Kyzylorda region and the Kyzylorda city. Within the Kyzylorda region, water quality in terms of microbiological and chemical indicators does not meet the sanitary standards. Most disadvantageous situation with the quality of drinking water is observed in the Kyzylorda city and in the Kyzylorda region, where chemical-analytical indicators of water hardness, turbidity, color, presence of sulfates and dry residue does not meet the maximum permissible concentration standards.

For example, in 12 months of 2005, the quality of water taken from the Syr Darya river (water intake area) did not meet the GOST standard "Drinking water" as follows: chroma level exceeded the MPC level by 3.2 times; turbidity – by 11.2 times; hardness - by 1.5; sulfates – by 1.1, magnesium – by 3.8; and bromine – by 3.4 times.

Water from the wells: turbidity – 1.9 times; dry residue – by 1.0 times.

Running water: chroma level – by 1.0 times, turbidity – 1.5 times (Table 1).

Table 1

**Qualitative characteristics of drinking water (GOST "Drinking Water") in the city of Kyzylorda in 2004- 2005**

| Indicators | MPC GOST «Drinking Water" | Syr Darya river (water intake facility) | | | | Water wells | | | | Running water (at the exit) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2004 | MPC exceedance превышение МРС, раз | 2005 | MPC exceedance-раз | 2004 | MPC exceedance-раз | 2005 | MPC exceedance-раз | 2004 | MPC exceedance-раз | 2005 | MPC exceedance-раз |
| Smell | 2 б. | 1.0 | | 1.0 | | 0 | | 0 | | 3 | **1.5** | 0 | |
| Chromaticity | 25° | 52.0 | **2.1** | 80.0 | **3.2** | 22.0 | | 23.0 | | 38.5 | **1.5** | 26.0 | **1.0** |
| Turbidity | 1.5 | 33.5 | **22.3** | 16.8 | **11.2** | 2.0 | **1.3** | 2.9 | **1.9** | 6.0 | **4.0** | 2.3 | **1.5** |
| Ammonia | 2 | 0.45 | | 0.5 | | 0.8 | | 0.2 | | 1.3 | | 1.01 | |
| Nitrite | 3.3 | 0.016 | | 0.05 | | 0.03 | | 0.01 | | 0.01 | | 0.01 | |
| Nitrates | 45 | 1.9 | | 1.15 | | 1.8 | | 2.6 | | 3.9 | | 3.5 | |
| Chloride | 350 | 82.0 | | 91.5 | | 268.0 | | 100.5 | | 110.0 | | 115.0 | |
| Hardness | 7 | 10.9 | **1.5** | 10.5 | **1.5** | 6.5 | | 6.5 | | 6.5 | | 6.5 | |
| Iron | 0.3 | 0.06 | | 0.24 | | 0.09 | | 0.14 | | 0.75 | **2.5** | 0.22 | |
| Sulfates | 500 | 615.0 | **1.2** | 562.5 | **1.1** | 542.5 | **1.1** | 495.0 | | 570.0 | **1.1** | 457.0 | |
| Dry residue | 1000 | 1035.5 | **1.0** | 1000 | | 1127.5 | **1.1** | 1050 | **1.0** | 1035 | **1.0** | 960.0 | |
| Copper | 1 | 0.2 | | 0.27 | | 0.06 | | 0.03 | | 0.3 | | 0.18 | |
| pH | 7 | - | | - | | - | | - | | - | | - | |
| Manganese | 0.1 | 0.11 | | 0.1 | | 0.1 | | 0.1 | | 0.09 | | - | |
| Calcium | 180 | 89.1 | | 95.1 | | - | | - | | - | | - | |
| Magnesium | 40 | 79.0 | **2.0** | 151.9 | **3.8** | - | | - | | - | | - | |
| Fluorine | 0.7 | 0.37 | | 0.5 | | 0.64 | | 0.45 | | 0.4 | | 0.3 | |
| Chromium 6+ | 0.05 | 0.025 | | 0.01 | | 0.05 | | 0.1 | | 0.02 | | - | |
| Aluminum | 0.5 | - | | - | | - | | - | | - | | - | |
| Bromine | 0.2 | 0.2 | | 0.69 | **3.4** | 0.05 | | 0.02 | | 0.14 | | - | |
| Iodine | | 0.34 | | 0.9 | | 0.05 | | 0.1 | | 0.2 | | - | |
| Transparency | 25 | 9.5 | | 12.0 | | - | | - | | - | | - | |
| Oxidability | 5 | 2.6 | | 0.44 | | - | | - | | - | | - | |
| Alkalinity | | 2.75 | | 3.2 | | - | | - | | - | | - | |
| Dissolved $O_2$ | | 8.2 | | 5.9 | | - | | - | | - | | - | |
| $BOD_5$ | | 4.5 | | 2.0 | | - | | - | | - | | - | |



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As can be seen from the above data, in 2005, the quality of the Syr Darya river water was worse than in 2004 in terms of chroma, magnesium and bromine maximum permissible concentrations for drinking-water reservoirs. So far, the hardness level remained at the 2004 level and the rate of sulfate and dried residue was down 1 time.

Unsatisfactory situation to provide the population with quality drinking water is explained by increased number of technically faulty water pipes, untimely repair and elimination of failures, interruptions in water supply, lack of disinfectants at main waterworks intakes.

Status of water quality in the Syrdarya river near the Kyzylorda city is characterized by quality class 3 – mildly polluted water body.

In 2005, the Syrdarya river water quality, in terms of fishery category, in the Zhanakorgan, Kyzylorda and Kazalinsk river stations can be characterized as follows:

The MPC level is exceeded at the following pollutants:

In Zhanakorgan district: BOD standard level is exceeded by 1.5 times, hardness – by 1.6; magnesium – by 1.9, iron – by 1.1, dry residue – by 1.3, chrome – by 10 and sulphate – by 5.2 times.

Within the Kyzylorda city boundaries: BOD standard level is exceeded by 1.6 times, hardness – by 1.6; magnesium – by 2.1; iron – by 1.2; dry residue – by 1.3; petroleum products – by 1.2; nitrite nitrogen - by 1.0; copper – by 3; chrome – by 9 and sulphates – by 5.8 times.

In the Kazalinsky district: BOD standard level is exceeded by 1.8 MPC, hardness – by 2.2; magnesium – by 2.8; iron – by 1.5; dry residue – by 1.6; petroleum products – by 2.0; nitrite nitrogen – by 1.1; copper – by 4; chromium – by 18; cadmium – by 10 and sulfates – by 6.1 times (Table 2):



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Table 2

**Qualitative characteristics of the Syr Darya River water in the Kyzylorda region**

in 2004 - 2005 (average values)

| MPC for fishery water bodies | | Zhanakorgan | | | Kyzylorda | | | Kazaly | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2004 | 2005 | Рост 05/04 | 2004 | 2005 | Рост 05/04 | 2004 | . 2005 | Рост 05/04 |
| pH | 6.8-8.5 | 6.97 | 7.05 | +1.0 | 7.20 | 7.02 | -1.0 | 7.70 | **6.95** | -1.1 |
| $BOD_5$ mgO/l | 2.0 | 2.65 | 2.92 | +1.1 | 2.66 | 3.14 | +1.2 | 3.0 | **3.53** | +1.2 |
| Exceedance MPC | | **1.3** | **1.5** | | **1.33** | **1.6** | | **1.5** | **1.8** | |
| Oxides. per-man-ganate. $mgO_2/dm^3$ | 10.0 | 4.37 | 4.12 | -1.1 | 3.53 | 4.41 | +1.2 | 4.1 | 3.93 | -1.0 |
| Hardness | 7.0 | 12.8 | 11.6 | -1.1 | 10.6 | 11.6 | +1.1 | 10.8 | 15.2 | +1.4 |
| Exceedance MPC | | **1.8** | **1.6** | | **1.5** | **1.6** | | **1.5** | **2.2** | |
| Chloride | 350.0 | 126.7 | 164.5 | +1.3 | 97.8 | 144.1 | +1.5 | 114.6 | 143.0 | +1.2 |
| Calcium | 180.0 | 105.5 | 102.4 | -1.0 | 99.7 | 89.6 | -1.1 | 104.4 | 110.0 | +1.0 |
| Magnesium | 40.0 | 92.4 | 75.8 | -1.2 | 68.3 | 82.4 | +1.2 | 69.8 | 114.1 | +1.6 |
| Exceedance MPC | | **2.3** | **1.9** | | **1.7** | **2.1** | | **1.7** | **2.8** | |
| Iron | 0.3 | 0.38 | 0.32 | -1.2 | 0.46 | 0.36 | -1.3 | 0.48 | 0.45 | -1.1 |
| Exceedance MPC | | **1.3** | **1.1** | | **1.5** | **1.2** | | **1.6** | **1.5** | |
| Oil product | 0.05 | 0.051 | 0.043 | -1.2 | 0.013 | 0.061 | +4.7 | 0.030 | 0.102 | +3.4 |
| Exceedance MPC | | **1.0** | - | | - | **1.2** | | - | **2.04** | |
| Dry residue | 1000.0 | 1147.5 | 1293 | +1.1 | 1512 | 1319.7 | -1.1 | 1568 | 1640 | +1.0 |
| Exceedance MPC | | **1.1** | **1.3** | | **1.5** | **1.3** | | **1.6** | **1.6** | |
| Ammonia nitrogen | 0.39 | 0.42 | 0.37 | -1.1 | 0.40 | 0.35 | -1.1 | 0.49 | 0.38 | -1.3 |
| Exceedance MPC | | **1.1** | **-** | | **1.0** | **-** | | **1.2** | - | |
| Nitrite nitrogen. | 0.02 | 0.024 | 0.018 | -1.3 | 0.115 | 0.021 | -5.5 | 0.064 | 0.023 | -2.8 |
| Exceedance MPC | | **1.2** | **-** | | **5.7** | **1.0** | | **3.2** | **1.1** | |
| Nitrate nitrogen | 9.1 | 6.13 | 4.54 | -1.3 | 7.69 | 4.64 | -1.6 | 15.6 | 6.01 | -2.6 |
| Exceedance MPC | | **-** | **-** | | **-** | **-** | | **1.7** | **-** | |
| Suspended solids | - | 39.6 | 101.6 | +2.6 | 45.5 | 102.4 | +2.2 | 36.0 | 94.8 | +2.6 |
| Copper | 0.001 | 0.009 | 0.001 | -9.0 | 0.003 | 0.003 | | 0.01 | 0.004 | -2.5 |
| Exceedance MPC | | **9.0** | **-** | | **3.0** | **3.0** | | **10.0** | **4.0** | |
| Chrome | 0.02 | 0.016 | 0.010 | -1.6 | 0.01 | 0.009 | -1.1 | 0.02 | 0.018 | -1.1 |
| Sulphates | 100 | 421.4 | 524.0 | +1.2 | 496.0 | 585.4 | +1.2 | 621.6 | 614.3 | -1.0 |
| MPC exceedance | | **4.2** | **5.2** | | **5.0** | **5.8** | | **6.2** | **6.1** | |



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Comparing water quality along three river stations in 2004-2005, it is clear that in 2005 compared to 2004 the water quality in the Syrdarya river worsened by 6 components (pH, BOD, chlorides, dry residue, suspended solids, sulphates) Zhanakorgan district; by 8 components (BOD, oxidation characteristic, hardness, chloride, magnesium, petroleum products, suspended solids, sulphates) in the city of Kyzylorda; and by 9 components (BOD, hardness, chloride, calcium, magnesium, petroleum products, dry residue, suspended solids) in the Kazalinsky district.

As is seen from the tables, in 2004 and 2005, the poorest water quality regarding its pollutant concentrations exceeding the MPC level was observed, first of all, in the Kazalinsky district, then in the Kyzylorda city and Zhana-Korgan district. In all the areas under study, maximum permissible concentrations, BOD, hardness, magnesium, iron and dry residue levels were above the standard level.

In the reporting period, the largest growth in the diseases of blood and blood-forming organs was recorded in almost all the entire region except for Kazalinsky district and the city of Kyzylorda. The iron deficiency anemia occupies the leading place. Such factors as monotonous protein-carbohydrate diet, low consumption of fruits and vegetables, traditional tea during meal or immediately after it, and inherited immune disorders in combination with the impact of adverse environmental factors are the major causes of the deseases. The results of the study undertaken by a team of Japanese and Kazakhstani specialists led by doctor Mamok Chiba, show that iron deficiency is an important component of the anemia observed at the Kyzylorda region population. Nevertheless, it is impossible to explain all cases of anemia by iron deficiency only. Further studies are needed to assess the effects of iron deficiency in the body, genetic and immune disorders, and the impact of adverse environmental factors. Also, in most of the surveyed areas,

increased number of the endocrine system, kidney and nervous system diseases was recorded.

One of the major environmental aspects resulting in an increased frequency of urinary tract diseases is the deterioration of physical and chemical properties of the drinking water. Also, climatic conditions of Kyzylorda region have critical impact on the development of urinary tract diseases: a hot climate, the loss of water through sweat, intensive UV radiation contributes to dehydration of the body and accumulation of vitamin D, which creates conditions for the formation of stones in the urinary tract and disorders in tubular renal function.

Aral region is leading among the areas of the region by growth in the number of diseases; so, out of 9 nosologies, growth is marked by 7 nosologies; in Zhalagash district , growth by 6 nosologies; in Kazalinsk and Zhanakorgan districts by 5 nosologies. Out of the reported diseases among the children under 14 years over the last 9 months of 2005, the largest percentage of respiratory system diseases - 41.8% of all registered diseases; blood diseases and diseases of blood-forming organs rank second - 14.7%, including anemia is 96.6% of the number of blood diseases; diseases of the digestive system rank third - 8.5%.

The digestive system diseases with most children in the region are related to blood diseases, in



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particular to anemia. Thus, according to the national children's rerehabilitation center "Urpak" (Almaty), "digestive system diseases are detected with all children of the Aral crisis (8.5%). Atrophic gastritis with severe morphological changes in gastric mucosa in the form of dysplasia, intestinal metaplasia, precancerous changes in the mucus membrane of the stomach are diagnosed with younger children. Chronic gastritis is accompanied by dysbacteriosis of the stomach with the identification of various microorganisms. Diseases of the digestive tract explain the presence of anemia with all the children, which vary by degrees (96.6%), due to malabsorption of iron. Over the last 9 months of 2005 compared to the same period of 2004, in the context of districts, the greatest growth lies with the respiratory system diseases (growth by all districts of the region). Also, in most of the districts, it was observed an increase in diseases of the endocrine system, diseases of the circulatory system. Among the districts of the region, Aral district is leading by the growth in the number of diseases; so out of 9 nosologies, the growth was noted by 7 nosologies; the growth by 6 nosologies was recorded in Syrdarya, Shieli, Zhanakorgan districts, and Kyzylorda. Thus, the deterioration of the environmental situation in the Aral Sea region impose high requirements to human health, result in tension of adaptive resources of the body. Complicated environmental situation with every year is one of the main causes of health deterioration of local residents, including health of mother and child. Currently, the level of malignant neo-formations is largely dependent on environmental factors. Therefore, cancer comes to the fore as one of the critical issues of modern medicine and the environment.

In the structure of malignant tumors diseases of the Kyzylorda region population, a share of the of the digestive system exceeds 56.6%, of which esophageal cancer accounts for up to 50.9%. Over the past 15 years in the structure of diseases, esophageal cancer continuously ranks first both among men and among women; stomach cancer ranks second stably, and liver cancer from 1992 moved to third rank. These diseases can be attributed to regional pathologies of Kyzylorda region.

Epidemiological surveys conducted in different countries have showed interrelation between the esophageal cancer disease, liver and stomach cancer disease and climatic-geographical conditions, the nature of nutrition, features of everyday life, occupational hazards, a viral hepatitis, levels of carcinogens content in the human environment.

Compared to the average republican indicators for 2003, it was noted the growth of malignant neoplasm diseases in 2004 in Kyzylorda by 1.02 times (RoK - 193.4, Kyzylorda city - 197.5). Over the first 9 months of 2004-2005, a rate of malignant neoplasm diseases by the region had been decreased by 1.1 times, whereas there was the tendency of mortality increase by 1.04 times from cancer (pancreatic cancer, esophageal cancer and others). (Table 3).

The highest rate of this disease by districts of the region was noted in Karmakshin district (Table 3), in whose area there is Baikonur Cosmodrome; however, compared to the first 9 months of 2004, in 2005 it was noted a decline in the rate by 1.1 times; for the analyzed period of time, the growth of cancer had been increased in Kyzylorda by 1.01 times.



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**Table 3**

**Key Indicators of Oncology Service of the Kyzylorda Region in the Context of Districts over the First 9 Months in 2004-2005**

| Name of districts | morbidity rate | | | mortality | | |
|---|---|---|---|---|---|---|
| | The first 9 months of 2004 | The first 9 months of 2005 | Growth | The first 9 months of 2004 | The first 9 months of 2005 | Growth |
| RoK anual | 194.2 | | | 120,5 | | |
| Region | 121.3 | 108.2 | -1.1 | 66.9 | 69.9 | +1.04 |
| Kyzylorda | 132.7 | 133.4 | +1.01 | 75.6 | 72.1 | -1.05 |
| Aral | 131.6 | 88.6 | -1.5 | 92.5 | 77.2 | -1.2 |
| Kazaly | 116.5 | 98.3 | -1.2 | 59.6 | 88.5 | +1.5 |
| Karmakchy | 181.6 | 166.1 | -1.1 | 77.8 | 52.5 | -1.5 |
| Zhalagash | 101.7 | 97.9 | -1.0 | 79.4 | 48.9 | -1.6 |
| Syrdarya | 105.1 | 78.6 | -1.3 | 53.8 | 83.6 | +1.5 |
| Shieli | 114.2 | 94.1 | -1.2 | 54.4 | 54.2 | -1.0 |
| Zhanakorgan | 72.2 | 65.6 | -1.1 | 30.3 | 71.3 | +2.3 |

The largest increase in the mortality rate from cancer by 2.3 times was recorded in Zhanakorgan district, and in Syrdarya and Kazalinsk districts, the mortality rate had been increased by 1.5 times, respectively; the mortality rate by the region on the whole had been increased by 1 time.

Intensive shallowing of the Aral Sea increased salinization process of the groundwater. According to leading oncologists of the Republic of Kazakhstan (A.P. Pozdnyakova), the highest morbidity in Kazakhstan is concentrated around four large reservoirs: the Caspian Sea, the Aral Sea, Balkhash, Zaisan, indicating the presence here of certain environmental factors that increase the frequency of the digestive system cancer. Chemical elements, mainly halogens (chloride, fluorine, and etc.), alkali elements (sodium, calcium, potassium) are accumulated in the soil of these regions. There is a hypothesis that salinity of soil contributes to increase the frequency of esophagus cancer method, and may serve as an indicator to forecast the level of this disease.

Thus, the existing levels of salinity, water hardness, active solar radiation, salt and dust storms, environmental pollution with carcinogens, development of oil production, peculiarities of nutrition have a negative impact on the human health and development of precancerous and tumor diseases of the digestive system of the population in Kyzylorda region.

Water belongs to the primary components of life support. A human being consumes water through-



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out his/her life, so it can be attributed to a permanent factor of chronic imimpact. Hence, there are special requirements to the quality of drinking water. The primary source of water supply for Kyzylorda is the Syrdarya River (about 80%), as well as wells, and water columns (about 20%).

Inadequate provision of population with safe drinking water is one of the important causes of deterioration in the population health of the region. Incidence rate of acute intestinal infections and viral hepatitis in the region has reached high numbers, exceeding a republican indicator by several times (Table 4).

**Table 4**

**Incidence Rate of the Population in Kyzylorda Region with Viral Hepatitis "A" for the Period of the First 9 Months. 2004-2005.**

| Name of districts | The first 9 months of 2004 | | The first 9 months of 2005 | | Growth indicator (+/- times) | |
|---|---|---|---|---|---|---|
| | indicator | | indicator | | | |
| | total | children | total | children | total | children |
| Kyzylorda region | 70.3 | 193.4 | 89.8 | 259.8 | + 1.3 | + 1.3 |
| Aral | 23.1 | 42.9 | 39.2 | 95.1 | +1.7 | +2.2 |
| Kazaly | 1.4 | 4.1 | 8.4 | 25.5 | +6.0 | +6.2 |
| Karmakchy | 41.1 | 130.1 | 10.4 | 27.7 | -3.9 | -4.5 |
| Zhalagash | 27.4 | 72.0 | 46.4 | 128 | +1.7 | +1.8 |
| Syrdarya | 97.7 | 263.5 | 58.2 | 196.1 | -1.7 | -1.3 |
| Shieli | 25.3 | 55.5 | 26.5 | 63.9 | +1.05 | +1.1 |
| Zhanakorgan | 40.5 | 97.0 | 37.0 | 110.4 | -1.1 | +1.1 |
| Kyzylorda | 150.3 | 434.2 | 216.4 | 618.2 | +1.4 | +1.4 |

The highest morbidity rate of population with viral hepatitis "A" for the first 9 months of 2005 by the region was recorded in Kyzylorda (above the regional indicator by 2.4 times), as compared with 2004, the growth was by 1.4 times.

In terms of districts of the region, the highest growth rate was recorded in Kazaly district (more than 6 times compared to the last year). Decline in morbidity rate of population was noted in Karmakshy and Syrdarya districts (Table 5). The highest morbidity rate of population with acute intestinal infections was also noted in Kyzylorda (above the regional indicator by 2.3 times). Decrease in the morbidity rate was reported in Kazaly, Zhalagash, Syrdarya districts. (Table 5).

One of the causes of occurrence of viral hepatitis and intestinal infections is discharge of sewage waters into the Syrdarya river, which have a low level of treatment by chemical indicators and which do not attain the required degree of treatment by microbiological parameters. Unfortunately, currently there is a situation where the level of anthropogenic pollution of water supply sources in Kyzylorda has been significantly increased, and the functioning water treatment technology is unable to effectively purify water, i.e. assure its quality in relation to infectious agents, especially acute intestinal infections and viral hepatitis.



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**Table 5**

**Incidence Rate of the Population in Kyzylorda Region**

**with Acute Intestinal Infections for the Period of the First 9 Months of 2004-2005**

| | 2004 | | 2005 | | Growth indicator (+/- times) | |
|---|---|---|---|---|---|---|
| | indicator | | indicator | | | |
| | total | children under14 years | total | children under14 years | total | children under14 years |
| Kyzylorda region | 272.9 | 427.8 | 310.9 | 546.9 | +1.1 | +1.3 |
| Aral | 65.1 | 133.0 | 67.0 | 116.8 | +1.03 | -1.1 |
| Kazaly | 194.9 | 340.2 | 153.1 | 263.6 | -1.3 | -1.3 |
| Karmakchy | 158.0 | 143.9 | 96.1 | 152.6 | -1.6 | +1.1 |
| Zhalagash | 84.6 | 136.0 | 53.8 | 120.0 | -1.6 | -1.1 |
| Syrdarya | 316.2 | 658.9 | 111.5 | 255.8 | -2.8 | -2.6 |
| Shieli | 74.8 | 162.7 | 103.6 | 191.9 | +1.4 | +1.2 |
| Zhanakorgan | 161.8 | 417.7 | 209.6 | 484.0 | +1.3 | +1.1 |
| Kyzylorda | 549.1 | 752.3 | 714.8 | 1178.5 | +1.3 | +1.6 |

The impact of harmful environmental factors on the immune status of the body in recent years has been proved and described by scientists all over the world. Therefore, the growth pathologies development in our area is inextricably associated with the violation of the immune system of the body, because it is the most sensitive to disturbance of the environmental balance in nature.

Observations conducted in 2005 over the level of contamination of surface and groundwater, as well as radiation status have enabled to:

- obtain the system of indicators characterizing the environmental status and health of urban population;

- assess the environmental status of the Aral region and population health of Kyzylorda and Kyzylorda region, and to identify trends in its changes.

Selection of monitoring points is based on the principles taking into account importance of the objects, the degree of contamination, accessibility, economic factor. Requirements to organization of observations of environmental pollution state include: systematic observations, their integrity and compliance. For comparability and reliability of observations data on environmental pollution (surface and ground water, background radiation), all guidelines to perform this work beginning with observation and up to obtaining of information are the same for the Republic of Kazakhstan.



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In the process of work, in 2005, was studied the state of contamination of surface and ground water, radiation, background monitoring and inspection of public health of Kyzylorda city. Observation points and en-route observations to study contamination of surface water of the Syr Darya river and ground water, were located taking into account the state and prospects of the use of water supply sources. During the survey of contamination of surface water and groundwater, in the samples, were identified the following physical and chemical parameters: temperature, suspended substances, color, transparency, pH, dissolved oxygen, $BOD_5$, salinity, COD, the main elements of salt composition, nutrients and basic contaminants: oil products, phenols, heavy metals.

Conducted in 2005 monitoring survey of the state of environmental pollution and public health, suggests the following conclusions: the most unfavorable condition in the city of Kyzylorda and districts of the Oblast is with the quality of potable water, which by chemical analysis and list of such indicators as the hardness, turbidity, color, presence of sulphates, dry residue does not correspond to the maximum permissible concentrations. Comparing water quality at three river stations, in 2004 – 2005, it can be seen clearly, that in 2005, the water quality of the Syr Darya River has worsened as compared to 2004, in Zhanakorgan district for 6 components (pH, BOD, chlorides, dry residue, suspended substances, sulphates); in the city of Kyzylorda – for 8 components (BOD, oxidation, hardness, chlorides, magnesium, oil products, suspended substances, sulphates); in Kazalinsk district – for 9 components (BOD, hardness, chlorides, calcium, magnesium, oil products, dry residue, suspended substances).

One of the major environmental issues leading to increased incidence of diseases is the deterioration of the physical and chemical properties of the potable water. It is also an important role in the development of diseases of the urinary tract play a climate of Kyzylorda Oblast: a hot climate, the loss of water with sweat, enhanced UV radiation contributes to dehydration and the accumulation of vitamin D, which creates conditions for the formation of calculi in the urinary tract and disorders of tubular renal function.

Inadequate provision of safe drinking water is one of the important causes of ill public health in the region. The incidence of acute intestinal infections and viral hepatitis in the region reached high numbers, exceeding average state value by several times.

As we have previously stressed, the deterioration of the ecological situation in the Aral Sea region has high requirements for human health and leads to the intensive use of adaptive resources of the organism. Environmental situation coming worse every year is one of the main reasons for the deterioration of the public health. As in previous work, taking into account the interest of researchers to study the connection of surface water contamination and public health, we present trends of statistical data for the eight-year period of survey in the region (Table 6 A, B, C, D, E, F, G, H, I, J, K).



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Table 6

**Key values of Oncology Service of the Kyzylorda Oblast per one hundred thousand (100,000) Residents for 2000 – 2007.**

**A)**

| Name of the Districts | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| RoK | 191,7 | 195,9 | 197,3 | 193,4 | 194,2 | 192,5 | 186,7 | |
| Oblast | 149,0 | 142,3 | 159,1 | 169,9 | 168,3 | 155,3 | 141,2 | 159,9 |
| Kyzylorda | 179,3 | 172,0 | 184,7 | 187,8 | 197,5 | 196,3 | 169,7 | 184,6 |
| Aralsk | 192,1 | 193,6 | 195,9 | 206,1 | 170,7 | 125,8 | 141,3 | 168,1 |
| Kazaly | 141,4 | 129,2 | 151,1 | 177,9 | 163,4 | 132,1 | 110,1 | 128,1 |
| Karmakshy | 194,7 | 156,5 | 174,9 | 213,8 | 231,3 | 220,8 | 210,8 | 210,2 |
| Zhalagash | 103,0 | 114,4 | 114,1 | 151,3 | 141,4 | 132,2 | 138,8 | 160,7 |
| Syr Darya | 119,5 | 93,9 | 167,5 | 147,2 | 164,2 | 116,6 | 166,1 | 146,6 |
| Shiyely | 103,3 | 118,0 | 101,3 | 143,4 | 139,5 | 127,1 | 105,1 | 117,1 |
| Zhanakorgan | 89,3 | 85,5 | 102,1 | 90,5 | 109,8 | 114,2 | 103,3 | 130,3 |

**Key values of Oncology Service of the Kyzylorda Oblast per one hundred thousand (100,000) Residents for 2003 – 2007.**

**B)**

| Morbidity per 1,000 persons (established for the first time) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Districts | Morbidity | | | | | Mortality | | | | |
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2003 | 2004 | 2005 | 2006 | 2007 |
| RoK | 193,4 | 194,2 | 192.5 | 186,7 | - | 124,4 | 120,5 | - | - | - |
| Oblast | 169,9 | 168,3 | 155,3 | 141.2 | 159,9 | 106,7 | 110,5 | 108,7 | 104.8 | 102,2 |
| Kyzylorda | 187,8 | 197,5 | 196,3 | 169.7 | 184,6 | 94,9 | 118,3 | 103,9 | 131.4 | 116,4 |
| Aralsk | 206,1 | 170,7 | 125,8 | 141.3 | 168,1 | 162,8 | 143,2 | 130,1 | 113.0 | 138,4 |
| Kazaly | 177,9 | 163,4 | 132,1 | 110.1 | 128,1 | 117,2 | 95,2 | 123,6 | 87.8 | 94,7 |
| Karmakshy | 213,8 | 231,3 | 220,8 | 210.8 | 210,2 | 174,9 | 157,8 | 151,4 | 111.6 | 83,7 |
| Zhalagash | 151,3 | 141,4 | 132,2 | 138.8 | 160,7 | 96,7 | 116,6 | 80,8 | 104.7 | 90,1 |
| Syr Darya | 147,2 | 164,2 | 116,6 | 106.1 | 146,6 | 81,2 | 94,9 | 93,8 | 101.2 | 106,2 |
| Shiyely | 143,4 | 139,5 | 127,1 | 105.1 | 117,1 | 84,2 | 82,3 | 92,6 | 62.6 | 77,1 |
| Zhanakorgan | 90,5 | 109,8 | 114,2 | 103.3 | 130,3 | 73,2 | 57,7 | 98,5 | 80.7 | 76,4 |



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**C)**

| Districts | Morbidity per 1,000 persons (established for the first time) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Neglect | | | | | Morbidity | | | | |
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2003 | 2004 | 2005 | 2006 | 2007 |
| RoK | | | | | | | | | | |
| Oblast | 21,3 | 20,5 | 19,0 | 17.1 | 16,1 | 564,5 | 594,7 | 607,1 | 628.0 | 682,8 |
| Kyzylorda | 23,5 | 20,1 | 16,5 | 16.1 | 14,2 | 918,8 | 913,6 | 969,0 | 973.1 | |
| Aralsk | 18,8 | 22,0 | 32,9 | 18.0 | 17,7 | 433,7 | 449,9 | 406,2 | 423.7 | 450,5 |
| Kazaly | 16,6 | 16,5 | 22,8 | 15.1 | 22,2 | 364,4 | 457,6 | 431,5 | 445.7 | 476,3 |
| Karmakshy | 20,2 | 18,6 | 23,8 | 15.6 | 16,8 | | 605,5 | 628,8 | 715.1 | 83,9 |
| Zhalagash | 21,3 | 24,5 | 23,1 | 19.2 | 12,5 | 277,9 | 265,6 | 298,8 | 323.8 | 392,0 |
| Syr Darya | 22,4 | 21,8 | 19,5 | 11.9 | 19,2 | 434,1 | 744,4 | 494,5 | 477.9 | 513,3 |
| Shiyely | 21,1 | 19,1 | 15,6 | 22.7 | 16,1 | 502,6 | 539,5 | 537,5 | 585.4 | 632,3 |
| Zhanakorgan | 23,8 | 27,6 | 8,7 | 19.1 | 15,5 | 252,8 | 286,1 | 265,5 | 283.2 | 337,1 |

**Morbidity of population of Kyzylorda Oblast with malignant tumors (by localization) for 2000 – 2005**

**D)**

| No. | Name | Sex | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| 1. | Total | | 640 | 895 | 862 | 1027 | 1026 | 950 |
| 2. | Malignant tumors | Masculine | 308 | 408 | 422 | 481 | 484 | 457 |
| | | Feminine | 332 | 487 | 440 | 546 | 542 | 493 |
| 3. | Esophageal cancer | Masculine | 57 | 66 | 62 | 66 | 49 | 61 |
| | | Feminine | 76 | 118 | 138 | 124 | 105 | 97 |
| 4. | Gastric cancer | Masculine | 54 | 61 | 82 | 82 | 83 | 66 |
| | | Feminine | 34 | 50 | 59 | 48 | 53 | 36 |
| 5. | Hepatic cancer | Masculine | 30 | 47 | 45 | 37 | 44 | 33 |
| | | Feminine | 24 | 24 | 15 | 24 | 22 | 16 |
| 6. | Trachea, lungs, bronchi cancer | Masculine | 54 | 86 | 114 | 107 | 103 | 98 |
| | | Feminine | 18 | 20 | 37 | 44 | 39 | 52 |
| 7. | Skin cancer | Masculine | 19 | 17 | ? | 16 | 17 | 16 |
| | | Feminine | 15 | 22 | ? | 21 | 14 | 19 |
| 8. | Breast cancer | Feminine | 31 | 47 | 47 | 61 | 53 | 58 |
| 9. | Cervical cancer | Feminine | 13 | 39 | 24 | 33 | 43 | 20 |
| 10. | Ovarian carcinoma | Feminine | 13 | 13 | 18 | 17 | 17 | 23 |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11. | Cerebrum cancer | Masculine | 7 | 19 | 20 | - | 26 | 36 |
| | | Feminine | ? | 8 | 19 | - | 35 | 34 |
| 12. | Blood cancer | Masculine | 20 | 23 | 22 | 19 | 26 | 23 |
| | | Feminine | 13 | 13 | 21 | 10 | 30 | 14 |

**Morbidity of population of Kyzylorda Oblast with malignant tumors (by localization) for 2006 – 2007 (absolute value)**

**E)**

| Name | Sex | 2006 | 2007 | Increase, % |
|---|---|---|---|---|
| Total malignant tumors including: | | 874 | 989 | 13,1 |
| | Masculine | 424 | 465 | 9,7 |
| | Feminine | 450 | 524 | 16,0 |
| Esophageal cancer | Masculine | 60 | 60 | - |
| | Feminine | 91 | 99 | 8,8 |
| Gastric cancer | Masculine | 69 | 69 | - |
| | Feminine | 41 | 38 | - |
| Hepatic cancer | Masculine | 48 | 39 | - |
| | Feminine | 20 | 27 | 35,0 |
| Trachea, lungs, bronchi cancer | Masculine | 76 | 91 | 19,7 |
| | Feminine | 21 | 30 | 42,8 |
| Breast cancer | Feminine | 76 | 72 | - |
| Cervical cancer | Feminine | 38 | 38 | - |
| Ovarian carcinoma | Feminine | 19 | 22 | 15,8 |
| Cerebrum cancer | Masculine | 24 | 28 | 16,7 |
| | Feminine | 10 | 62 | By 3.4 times |
| Blood cancer (lymphoid and blood-forming tissue) | Masculine | 23 | 23 | - |

**Diseases of the genitourinary system**

**F)**

| Name of the Districts | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| RoK | 3334,8 | 3623,4 | 4238,0 | 3948,6 | 4050,2 | 4365,1 | 4377,9 | |
| Oblast | 4708,8 | 5085,1 | 6063,7 | 6036,5 | 5513,5 | 5529,6 | 5837,9 | 4950,0 |
| Kyzylorda | 4977,0 | 4899,4 | 4950,5 | 5217,1 | 4755,0 | 4799,3 | 5149,3 | 4858,7 |
| Aralsk | 4256,9 | 4030,3 | 6704,6 | 5547,2 | 4528,8 | 6438,4 | 5719,1 | 4272,7 |
| Kazaly | 6897,8 | 770,7 | 9920,9 | 9570,8 | 9338,4 | 9692,4 | 9812,3 | 10535,5 |
| Karmakshy | 2692,1 | 2678,3 | 2678,3 | 4383,5 | 4347,5 | 4493,5 | 3362,8 | 1999,3, |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Zhalagash | 3077,7 | 3124,1 | 3962,8 | 5141,0 | 4592,8 | 5344,4 | 6009,3 | 4610,9 |
| Syr Darya | 4170,9 | 5949,2 | 7500,0 | 6280,9 | 4032,5 | 3910,1 | 5245,2 | 3037,9 |
| Shiyely | 4453,8 | 5707,7 | 6457,9 | 6037,4 | 6261,4 | 4161,7 | 5796,2 | 3324,4 |
| Zhanakorgan | 5116,8 | 5535,5 | 6679,6 | 6720,6 | 6101,4 | 5691,1 | 5847,9 | 5196,0 |

**G) Diseases of the genitourinary system**

| Districts | Total | | | | Adults | | | | Teenagers | | | | Children | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 |
| RoK | 3948,6 | 4050,2 | 4365,1 | 4377,9 | 4751,3 | 4827,8 | 5295,3 | 5313,1 | 3644,6 | 3969,7 | 3733.1 | 3969,8 | 1867,9 | 1912,4 | 1879.0 | 1765,5 |
| Oblast | 6036,5 | 5513,5 | 5529,6 | 5837,9 | 7631,3 | 7002,1 | 6804,0 | 7548,0 | 6867,0 | 5852,7 | 6223,0 | 5289.3 | 2983,2 | 2665,6 | 2917,0 | 2611.5 |
| Kyzylorda | 5217,1 | 4755,0 | 4799,3 | 5149,3 | 7095,4 | 6773,6 | 6417,9 | 7095,6 | 5241,1 | 3569,0 | 3954,7 | 3449.6 | 1815,1 | 1332,9 | 1630,7 | 1175.1 |
| Aralsk | 5547,2 | 4528,8 | 6438,4 | 5719,1 | 8091,5 | 6038,5 | 8410,6 | 8240,4 | 4361,6 | 3592,1 | 8783,4 | 2520.7 | 1355,5 | 2003,0 | 2421,1 | 1831.5 |
| Kazaly | 9570,8 | 9338,4 | 9692,4 | 9812,3 | 11236,9 | 10438,7 | 10903,8 | 11007,4 | 13045,6 | 13399,9 | 12043,4 | 10856 | 6063,7 | 6605,8 | 7098,0 | 7405.7 |
| Karmakshy | 4383,5 | 4347,5 | 4493,5 | 3362,8 | 4490,5 | 5351,2 | 5896,5 | 4610,8 | 5032,3 | 5498,9 | 4563,6 | 3544.4 | 4037,2 | 2005,8 | 1665,5 | 792.4 |
| Zhalagash | 5141,0 | 4592,8 | 5344,4 | 6009,3 | 4853,8 | 4174,7 | 4763,2 | 6261,4 | 7612,1 | 6964,8 | 7064,4 | 6930.7 | 5207,7 | 4976,0 | 6171,7 | 5293.3 |
| Syr Darya | 6280,9 | 4032,5 | 3910,1 | 5245,2 | 7844,6 | 4112,0 | 1024,4 | 6258, | 2905,8 | 5742,8 | 7142,9 | 6729.0 | 3696,2 | 3909,5 | 3001,8 | 2882.8 |
| Shiyely | 6037,4 | 6261,4 | 4161,7 | 5796,2 | 7603,2 | 8509,4 | 5060,2 | 97748,9 | 9240,0 | 6523,5 | 5239,5 | 6462.6 | 2598,9 | 2126,3 | 2321,2 | 2275.6 |
| Zhanakorgan | 6720,6 | 6101,4 | 5691,1 | 5847,9 | 8778,4 | 8092,9 | 7616,8 | 8142,6 | 8863,0 | 6979,7 | 6838,9 | 5623.3 | 2854,4 | 2378,7 | 2084,9 | 2081.5 |

**H) Diseases of the digestive system**

| Districts | Total | | | | Adults | | | | Teenagers | | | | Children | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 |
| RoK | 3688,7 | 3754,2 | 3762,0 | 3780,4 | 2628,8 | 2771,8 | 2726,2 | 2541,2 | 5567,3 | 5278,8 | 5438,6 | 6197,1 | 6061,1 | 6086,5 | 6289,3 | 6772,9 |
| Oblast | 7761,6 | 7069,7 | 9055,0 | 8505,6 | 6704,3 | 6259,2 | 7324,1 | 5831,1 | 12564,1 | 9163,6 | 17045,7 | 17304,5 | 8718,3 | 8143,7 | 10655,5 | 11829,0 |
| Kyzylorda | 2316,1 | 2155,3 | 7885,7 | 7460,9 | 1995,8 | 1828,9 | 6105,6 | 4607,1 | 2752,7 | 2497,8 | 17615,3 | 19853,9 | 2808,5 | 2705,1 | 9149,6 | 11016,6 |
| Aralsk | 7933,0 | 8199,4 | 8302,8 | 6897,1 | 10292,2 | 10010,0 | 10618,8 | 7462,6 | 6086,4 | 8501,3 | 7636,0 | 6115,7 | 4208,0 | 4913,4 | 4327,1 | 6038,3 |
| Kazaly | 23665,4 | 21608,5 | 24751,0 | 22003,4 | 17012,4 | 16296,9 | 15631,5 | 11887,7 | 43906,5 | 33879,8 | 64152,7 | 56655,8 | 31740,4 | 28974,7 | 34142,5 | 33323,4 |
| Karmakshy | 11612,8 | 3937,6 | 3956,5 | 5179,6 | 7020,0 | 2518,8 | 3135,4 | 4544,6 | 34172,6 | 9113,4 | 4532,9 | 7119,1 | 15373,7 | 5618,1 | 5375,1 | 6037,2 |
| Zhalagash | 8909,2 | 7779,2 | 7662,2 | 7553,4 | 6704,8 | 5947,1 | 6199,2 | 5892,6 | 19899,5 | 13573,4 | 14756,7 | 13458,0 | 11070,3 | 10312,0 | 9186,1 | 9680,5 |
| Syr Darya | 3368,8 | 4061,4 | 3920,2 | 3662,0 | 3176,7 | 3804,5 | 3520,4 | 3391,4 | 2241,6 | 4203,1 | 8298,8 | 4000,0 | 4000,7 | 4581,2 | 3875,2 | 4132,3 |
| Shiyely | 5747,7 | 5780,6 | 6058,6 | 5463,5 | 5503,9 | 5469,1 | 5242,7 | 3763,9 | 10262,3 | 9716,2 | 7155,4 | 7850,2 | 5253,4 | 5544,0 | 7308,7 | 7917,6 |
| Zhanakorgan | 8138,1 | 10086,5 | 7610,5 | 8146,6 | 9238,6 | 10377,3 | 7354,5 | 6233,8 | 6938,2 | 9541,1 | 8045,7 | 8883,0 | 6505,4 | 9685,1 | 7972,5 | 11169,0 |

**I) Congenital abnormalities**

| Districts | Total | | | | Adults | | | | Teenagers | | | | Children | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 | 2003 | 2004 | 2005 | 2006 |
| RoK | 176,2 | 181,7 | 173,2 | 168,3 | 56,7 | 59,2 | 44,6 | 41,3 | 332,6 | 312,1 | 231,5 | 265,0 | 457,7 | 489,1 | 524,3 | 512,9 |
| Oblast | 197,9 | 209,6 | 211,9 | 178,9 | 68,6 | 63,4 | 82,2 | 40,7 | 417,5 | 322,4 | 265,5 | 231,9 | 388,4 | 461,0 | 450,7 | 437,8 |
| Kyzylorda | 216,1 | 267,0 | 270,3 | 244,9 | 55,6 | 79,8 | 50,1 | 30,8 | 295,5 | 217,2 | 315,9 | 158,2 | 490,5 | 644,2 | 719,0 | 744,8 |
| Aralsk | 215,6 | 216,8 | 179,1 | 161,0 | 211,0 | 138,7 | 86,9 | 56,6 | 456,0 | 558,8 | 296,7 | 247,9 | 171,6 | 281,4 | 317,7 | 331,4 |
| Kazaly | 248,7 | 235,5 | 254,7 | 124,0 | 61,8 | 25,8 | 39,6 | 30,0 | 524,7 | 475,2 | 235,7 | 345,0 | 526,4 | 569,6 | 644,5 | 250,1 |
| Karmakshy | 56,2 | 83,9 | 59,7 | 55,8 | 10,7 | 20,8 | 17,2 | 39,7 | 184,2 | 92,7 | 61,3 | 0,0 | 114,6 | 208,3 | 144,5 | 100,7 |



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| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zhalagash | 79,4 | 64,5 | 86,1 | 126,6 | 75,5 | 35,6 | 58,9 | 15,5 | 0,0 | 0,0 | 431,7 | 476,7 | 103,8 | 136,0 | 71,4 | 278,2 |
| Syr Darya | 177,0 | 125,3 | 218,2 | 121,4 | 76,8 | 44,0 | 162,7 | 93,4 | 1245,3 | 1123,6 | 454,2 | 336,4 | 169,2 | 94,0 | 288,3 | 130,7 |
| Shiyely | 229,0 | 323,1 | 176,8 | 236,9 | 55,8 | 97,5 | 63,7 | 83,5 | 289,4 | 433,6 | 117,3 | 342,1 | 526,9 | 708,0 | 392,8 | 480,9 |
| Zhanakorgan | 218,0 | 103,7 | 243,0 | 150,1 | 14,8 | 0,0 | 250,3 | 4,9 | 738,6 | 85,4 | 211,7 | 152,5 | 424,7 | 289,4 | 236,3 | 391,0 |

| J) Diseases of the digestive system | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Name of the Districts** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| RoK | 3309.5 | 3285.0 | 3*979.3 | 3688,7 | 3754,2 | 3762.0 | 3780,4 | |
| Oblast | 5564.1 | 5538.5 | 8048.9 | 7761,6 | 7069,7 | 9055,0 | 8505.6 | 6531.5 |
| Kyzylorda | 2788.7 | 2857.2 | 2588.1 | 2316,1 | 2155,3 | 7885,7 | 7460.9 | 2193.6 |
| Aralsk | 4531.0 | 4746.0 | 8945.2 | 7933,0 | 8199,4 | 8302,8 | 6897.1 | 7841.9 |
| Kazaly | 16425.9 | 14148.1 | 21065.0 | 23665,4 | 21608,5 | 24751,0 | 22003.4 | 20087,4 |
| Karmakshy | 4991.3 | 3782.6 | 3782.6 | 11612,8 | 3937,6 | 3956,5 | 5179.6 | 4163.4 |
| Zhalagash | 9092.7 | 9436.7 | 16084.4 | 8909,2 | 7779,2 | 7662,2 | 7553.4 | 10403.9 |
| Syr Darya | 1329.1 | 2401.0 | 3812.2 | 3368,8 | 4061,4 | 3920,2 | 3662.0 | 2705.4 |
| Shiyely | 5021.9 | 4805.6 | 6884.2 | 5747,7 | 5780,6 | 6058,6 | 5463.5 | 4302.8 |
| Zhanakorgan | 4910.9 | 6709.1 | 9165.2 | 8138,1 | 10086,5 | 7610,5 | 8146.6 | 7752.3 |

| K) Congenital abnormalities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Name of the Districts** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| RoK | 153.0 | 163.2 | 188.0 | 176,2 | 181,7 | 173.2 | 168,3 | |
| Oblast | 133.0 | 137.6 | 170.8 | 197,9 | 209,6 | 211,9 | 178.9 | 139.8 |
| Kyzylorda | 175.4 | 178.9 | 149.5 | 216,1 | 267,0 | 270,3 | 244.9 | 217.3 |
| Aralsk | 199.1 | 177.5 | 154.1 | 215,6 | 216,8 | 179,1 | 161.0 | 172.4 |
| Kazaly | 151.1 | 141.0 | 279.6 | 248,7 | 235,5 | 254,7 | 124.0 | 104.1 |
| Karmakshy | 52.4 | 39.1 | 45.3 | 56,2 | 83,9 | 59,7 | 55.8 | 26.4 |
| Zhalagash | 50.1 | 44.7 | 71.9 | 79,4 | 64,5 | 86,1 | 126.6 | 88.9 |
| Syr Darya | 7.7 | 81.2 | 114.2 | 177,0 | 125,3 | 218,2 | 121.4 | 40.3 |
| Shiyely | 182.7 | 178.6 | 172.3 | 229,0 | 323,1 | 176,8 | 236.9 | 128.4 |
| Zhanakorgan | 48.2 | 83.9 | 307.4 | 218,0 | 103,7 | 243,0 | 150.1 | 94..5 |

The waste water contained in “sewage ditch” as the Syr Darya River, contain heavy metals, radioactive elements, pesticides and herbicides, toxic substances, hydrocarbons, phenols, petroleum products, etc. Unfortunately, the present monitoring of the Syr Darya River conducted by the RoK MEP has no control over the whole list of foreign substances. It is known, that to deal with all environmental issues of the watercourse considered, control over all the substances is needed in order to determine degree of hazard of



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these substances for the public health and state of ecosystems. For example, heavy metals (excluding rare and noble ones), include metals, density of which exceeding 8000 kg / m3. This includes: lead, copper, zinc, nickel, cadmium, cobalt, antimony, bismuth, mercury, tin, vanadium, chromium, iron, manganese, as well as arsenic. Many of them can cause serious diseases of internal organs, as well as malignant tumors. Depending on the hazard degree, heavy metals are divided into classes. The first (the most dangerous) class includes arsenic, mercury, selenium, lead and zinc. The second class includes cobalt, nickel, copper, molybdenum, antimony, chromium; the third class – vanadium, tungsten, manganese, strontium. The higher the hazard class of the heavy metal, the dose affects the less toxic, mutagenic or carcinogenic effects, the less its maximum permissible concentration in the atmosphere, soil, water, food.

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## Environmental Changes and Dust Emission in the Dried Bottom of the Aral Sea

*L. ORLOVSKY, L. SPIVAK, R. INDOITU, G. KOZHORIDZE, M. BATYRBAEVA, I. VITKOVSKAYA, N. ORLOVSKY (Israel)*

In the 1990s, the western world became aware of the ecological disaster of what was once the fourth largest lake in the world – the Aral Sea. The drastic desiccation of the Aral Sea led to the intensive development of desertification processes and formation of a new desert, the Aralkum. Study of temporal and spatial distribution of dust storms in 1936-2010 based on the data from meteorological network, showed decrease in dust storms frequency in Central Asia and changes in the dust source areas. Temperature and rainfall trends also showed significant changes across the region. At the same time, in the last few decades, the Aralkum has become the new "hot spot" of dust and salt storms in the region. Dust storms and their source areas have been determined and analyzed by the NOAA AVHRR, TOMS and OMI data. The analysis of the land cover changes in the dried bottom of the Aral Sea revealed that the north-eastern part of the Aralkum Desert is one of the most active dust sources in the region, responsible for high aerosol concentrations in the atmosphere. Dust plumes that sweep up from the dried bottom of the Aral Sea have become larger, and dust storms have become more powerful, since the bottom exposure. The monitoring algorithm have been developed and validated by ground truth data. The main change occurred in the land cover was the considerable reduction of vegetation and small water bodies, while the areas of solonchaks (salty pans) and sandy massifs increased significantly.



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# Monitoring locust habitats in the Amudarya River delta, Uzbekistan, using satellite remote sensing

*Fabian LÖW, Alexandre LATCHININSKY (Germany)*

Asian Migratory locust, Locusta migratoria migratoria L. is a serious crop pest in the Amudarya River delta near the Aral Sea in Uzbekistan, Central Asia. Its economic importance increased after desiccation of the Aral Sea. Vast areas of the former sea bottom became covered with stands of common reeds Phragmites australis, which are well-known as the main breeding locust habitat in this region. In order to enable efficient locust monitoring, accurate information about the spatial distribution of reeds is essential. Traditional ground-based locust monitoring is hardly possible in most areas of the delta, particularly on the former sea bottom. Due to its high revisit frequency, adequate spectral resolution and synoptic coverage, data from the MODIS satellite sensor aboard the Terra and Aqua platforms can provide the required information about spatio-temporal reed distribution in the Amudarya delta. Supervised image classification was applied to detect locust breeding areas and to monitor reeds in past and recent years. The random forest (RF) classifier algorithm was used to generate land cover maps for the period 2003-2014. Based on ground reference data from 2009, 2007, and 2004, a multi-year RF model was trained and then applied to the years without reference data. Classification accuracies of the multi-year RF model exceeded 85%. Additional efforts were recently spent on extending the methodology to provide early detection of potential breeding habitats within the growing season, and to analyse the correlation of water inflow to the delta and the spatial extent of locust breeding habitats. The results are instrumental for predicting potential locust outbreaks and developing better targeted management plans.



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# Bringing together Selenga-Baikal research 2015

**Chairperson(s):** *Jerker JARSJÖ, Daniel KARTHE, Ekaterina PROMAKHOVA*

- Vegetation dynamics of dry climatic zones from NDVI time series analysis and field investigations

  *Bair TSYDYPOV, E.Zh. GARMAEV, A.K. TULOKHONOV, Zh.B. ALYMBAEVA, B.V. SODNOMOV, A.A., AYURZHANAEV E.A. BATOTSYRENOV, Ts. CHIMEDDORJ, G. UDVAL (Russian Federation)*

- Steppe plant communities of Mongolian dry climatic zones

  *Zhargalma ALYMBAEVA, E.Zh. GARMAEV, B.Z. TSYDYPOV, E.A. BATOTSYRENOV, A.A. AYURZHANAEV, D.V. SANDANOV, G. UDVAL (Russian Federation)*

- The transformation of the landscape of the Selenga River Delta under the influence of hydrological regime

  *Maksim PAVLOV, Elena ILICHEVA (Russian Federation)*

- Dendrochronological reconstruction of Selenga River and its main tributaries runoff

  *Endon GARMAEV, S.G. ANDREEV, A.A. AYURZHANAEV, B.Z. TSYDYPOV (Russian Federation)*

- Lake Baikal as a natural phenomenon and which fingerprint was caused by use of its natural resources

  *Christian OPP, Endon GARMAEV, Tatiana ABIDUEVA (Germany)*

- Specific Features of the Accumulation and Spatial Distribution of Heavy Metals and Metalloids in Soils of Mining Landscapes (Zakamensk, Buryatia)

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- Geochemical changes of landscapes due to brown coal mining at the Sharyngol deposit in the Central Mongolia

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- Assessing the role of placer mines in sediment delivery to the Tuul River (Mongolia)

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- The Role of Urban Areas for IWRM Implementation in Mongolia: Experiences from Catchments of the Kharaa, Tuul and Orkhon Rivers

  *Daniel KARTHE (Germany)*

- Urban and Mining Geochemical Impact on Aquatic Systems of the Selenga River Basin

  *Mikhail LYCHAGIN, Sergey CHALOV, Galina SHINKAREVA (Russian Federation)*

- Impacts of climate and socio-economic change on water quality in the Selenga river basin: a model-based scenario analysis

  *Marcus Friedrich MALSY, Martina FLÖRKE, Joseph ALCAMO, Dietrich BORCHARDT (Germany)*



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- Conceptualizing a willow based wastewater treatment system for ger areas in Darkhan, Mongolia

  *Katja WESTPHAL (Germany)*

- The redistribution water and substance runoff through the main channels the Selenga river delta

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- The role of floods in sediment dynamics in Selenga river basin

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- Sediment Dispersal Linked to Hydrodynamics on the Selenga River delta topset, Lake Baikal: Combining Field Data and Morphodynamic Modeling

  *Jeff NITTROUER, Tian Yang DONG, Maksim PAVLOV, Gary PARKER, Brandon McElroy (USA); Elena ILICHEVA (Russian Federation)*

- Rainfall-runoff modelling in Selenga river basin: building the ECOMAG model parameter database

  *Vsevolod MOREIDO (Russian Federation)*

- Discussion and concluding remarks of the BRINGING TOGETHER SELENGA-BAIKAL RESEARCH 2015

  *Nikolay KASIMOV (Russian Federation), Jerker JARSJÖ (Sweden), Daniel Karthe (Germany)*

**POSTER EXIBITION**

- The Influence of urban settlement and mining activities on water resources in northern Mongolia

  *Gunsmaa BATBAYAR (Germany)*

- Interpretation of aquatic vegetation using hyperspectral images in terms of heavy metals accumulation

  *Mikhail TARASOV (Russian Federation)*

- Mining industry impact on suspended sediment concentration of the Selenga River Basin

  *Ekaterina PROMAKHOVA, Sergey CHALOV (Russian Federation)*

- A new smoothing-based atmospheric correction: application to classification on Léman/Baïkal campaign data

  *Manuel CUBERO-CASTAN (Switzerland); Mikhail TARASOV (Russian Federation)*



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## Vegetation dynamics of dry climatic zones from NDVI time series analysis and field investigations

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The aim of our work is to reveal and analyze changes in the vegetation cover of Russian and Mongolian dry climatic zones, using a variety of field and remote sensing studies. Approximately 85% of the Mongolian territory is located in dry climatic zones. For the investigation of vegetation dynamics model key polygons located in dry subhumid, semiarid, arid and extra-arid climactic zones of Russia and Mongolia were considered. For these polygons plots of the NDVI temporal variation and NDVI maps of its spatio-temporal dynamics on the basis of TM and OLI spectroradiometer imagery (satellite Landsat-5 and Landsat-8 respectively) were constructed. The full-scale landscape indication of the selected NDVI areas was conducted. This indication is supported by the analysis of vegetation by environmental groups for drought resistance. The vegetation digression during last 25 years is traced across almost the entire territory of the selected polygons. At the present time in different climatic zones of Central Asia and Transbaikalia there are different trends of desertification processes associated with both climatic fluctuations (mainly aridization) and anthropogenic impact.



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## Steppe plant communities of Mongolian dry climatic zones

*Zhargalma ALYMBAEVA, E.Zh. GARMAEV, B.Z. TSYDYPOV, E.A. BATOTSYRENOV, A.A. AYURZHANAEV, D.V. SANDANOV, G. UDVAL (Russian Federation)*

In dry climatic zones of Central Asia and Transbaikalia the trends of land degradation and desertification are different and related to climate variations and anthropogenic influence. The modern state of botanical diversity of steppe communities within transect 51-44 N and 104-108 E in Mongolia for 4 model key polygons is studied. Twenty one full geobotanical descriptions which included 84 species of vascular plants belonging to 60 genuses and 29 families were made. Descriptions are classified by dominant and determinantal principles. Groups of associations (formations) are marked (Stipeto-Anabasietum, Festuceto-Setarietum, Setarieto-Reaumurietum, Agropyro-Caricetum, Cleistogeno-Stipeto-Caricetum). Also we defined ecological status for them. For each key polygon meteorological data were received and processed from Russian Hydrometeorological archives and satellite-based meteorological information. Fifteen year trends of sums of air temperature, humidity and precipitation during the warm period are revealed. Constructions of ordination reflect the associations as coens which growing on dry and saline areas.



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# The transformation of the landscape of the Selenga River Delta under the influence of hydrological regime

*Maksim PAVLOV, Elena ILICHEVA (Russian Federation)*

The report considers the modern subaerial surface of the Selenga River delta in terms of allocation of landscapes under the geomorphological principle and its relationship with the hydrological processes. Dynamic of subaerial surface of the delta is caused by modern hydrological and geomorphological processes, which rate is indicated according to the formation of new and transformation of previously existing landscape elements and their corresponding with vegetation communities. We present the relationship of selected elements of landscapes with hypsometric (altitude) position, moistening and distance from the main bifurcation node. We carried out the landscape-hydrological and geomorphological zoning of the delta according to actual data of 2014. The landscape-hydrological and geomorphological features allows us defining relatively stable parts of the delta, and makes it possible to predict the development of the economic use of the territory.



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## Dendrochronological reconstruction of Selenga River and its main tributaries runoff

*Endon GARMAEV, S.G. ANDREEV, A.A. AYURZHANAEV, B.Z. TSYDYPOV (Russian Federation)*

Reconstruction of rivers runoff parameters in the Selenga River basin using data of gauging stations and dendroclimatological stations was carried out. As a result, we obtain the reconstruction model of the flow rate of the Selenga River and its tributaries on the Russian and Mongolian part of the basin: Uda, Khilok, Dzhida, Chikoy, Orkhon and Kharaa rivers. Chronological comparison of historical chronicles and moisture regime based on the obtained reconstruction was conducted.



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## Lake Baikal as a natural phenomenon and which fingerprint was caused by use of its natural resources

*Christian OPP, Endon GARMAEV, Tatiana ABIDUEVA (Germany)*

Lake Baikal is not only spectacular as the World's biggest fresh water body. Its genesis and natural feature are unique. These are some reasons for their species richness and their high level of endemism. The depth of the water body is the deepest, the sediments on the lake bottom are the thickest and the age of the sediments are the oldest among all the lakes of the earth. The Lake Baikal's very good water quality in general, for example the electric conductivity less than 60 µS/cm, the super-oligotrophy, the constant water temperature 3.6°C downwards 200m, the high oxygen content, the deep transparency and the nearly no accumulation of organic matter, are a result of poly-functional reasons. Among them the tectonic rifting seems to be the most important one holds the water clean. However, since the 20th century several land use activities affect Lake Baikal and the water quality of its tributaries. Although the construction of the Trans-Siberian Railway around the south-western part of the lake and the construction of the Baikal-Amur-Railway (BAM) at the northern edge of the Baikal did not have a direct impact to the lake, the follow-up-effects of these constructions by further use of natural resources affect the lake still today substantially. The construction of the Irkutsk water power station led for rising of the lake level more than one meter. For many decades the paper and pulp mills of Baikalsk and Selenginsk were the most well-known local waste water sources destroying the good water quality. Besides the natural sediment load of the tributaries, first of all via Selenga, Barguzin and Upper Angara, these tributaries and the use of the natural resources within their catchments as well as the communal and industrial agglomeration of Ulan-Ude are responsible for the lower water quality in the mouth areas of the tributaries. This can be shown with the help of satellite images, results from hydro-posts and surveys within the catchment.



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# Specific Features of the Accumulation and Spatial Distribution of Heavy Metals and Metalloids in Soils of Mining Landscapes (Zakamensk, Buryatia)

*Ivan V. TIMOFEEV, Natalia E. KOSHELEVA (Russian Federation)*

In recent years, considerable attention has been paid to the problem of environmental pollution in the basin of the Selenga River flowing into Lake Baikal. The city of Zakamensk—the center of mining of sulfide-tungsten and molybdenum ores—is one of the "hot spots." During 70 years, nearly 44.5 million tons of mine tailings enriched in Pb, Zn, F, Mo, W, Be, Bi, As, and other elements have been accumulated. The aim of our study was to reveal paragenetic associations of heavy metals and metalloids (HMs) in the upper (0–10 cm) horizon of urban soils and determine the main geochemical factors of their accumulation. The soil-geochemical survey of Zakamensk was performed in summer 2012. Soil samples (129 samples, including 24 samples of background soils) were analyzed for the bulk contents of 18 HMs (first–third hazard classes) and other elements by ICP-MS. Paragenetic associations of HMs with common zones of accumulation and discharge were identified using cluster analysis. The influence of natural and anthropogenic factors on the pollutants spatial distribution in soils and technogenic surface formations was estimated by the regression trees method in the S-Plus software (MathSoft, 1999). Two distinct polyelement associations (W–Bi–Be–Cs–Cu–Zn–Cd–Sn and As–Sb–Pb–Mo) and three paragenetic pairs of metals (V–Co, Sr–Ba, and Cr–Ni) were identified. The first two associations of HMs compose highly contrasting geochemical anomalies in the central part of the city with their maximum concentrations in tailings. In the Inkur River valley, where the mining of Au–W placer takes place, the topsoil horizon contains increased concentrations of V and Co. The Sr–Ba association is relatively evenly distributed and is characterized by element concentrations close to corresponding clarke values. The spatial distribution of Be, Bi, Cd, Cs, Cu, Sn, W, Zn, As, Mo, Pb, and Sb is controlled by the levels of anthropogenic loads. In the industrial and high-rise residential areas, it depends on the content of physical sand fraction produced during ore comminution. In other functional zones of the city, the accumulation of HMs depends on the soil physicochemical properties (pH and the contents of humus and sesquioxides) and on the environmental geochemical factors (position in the landscape and parent material). The levels of accumulation of Co, V, Cr, Ni, Ba, and Sr are controlled by the physicochemical soil properties.



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# Geochemical changes of landscapes due to brown coal mining at the Sharyngol deposit in the Central Mongolia

*Alexey ALEKSEENKO, Natalia KOSHELEVA, Nikolay KASIMOV, Sandag ENKH-AMGALAN (Russian Federation)*

The geochemical transformation of landscapes near Sharyngol brown coal open-pit in the Central Mongolia was considered. For this purpose, the landscape and land-use zoning was done, the levels of accumulation of heavy metals and metalloids in allocated zones were defined and the main factors that govern the geochemical changes during the deposit mining were identified. The study is based on the data of soil-geochemical survey in 2013. These include the contents of 20 metals and metalloids in 65 samples of topsoils (0-5 cm) and technogenic surface formations (TSF) which determined by mass spectrometry with inductively coupled plasma. The content of organic matter and the actual acidity were also determined. The analysis of the data showed that the geochemical transformation of steppe landscapes under coal mining impact is manifested in the formation of multielemental anomaly in dumps and the accumulation of pollutants in the adjacent city with their subsequent migration into the surrounding landscapes. Sharyngol coal mine dumps represent a source of landscapes pollution by the association of As-Bi-W-Mo, contents of which are much higher than abundances in lithosphere and sedimentary rocks and exceed the MPC of As up to 18 times; Mo –in 6 times; V – in 1.5 times. Due to the heating with coal and transport impact, the anomalies of Pb-Zn-Sb and PAHs are formed in the urban soils. Moreover, the urban soils are alkalized: the pH value changes from the background range of 6.2-6.7 to the values of 8.2-8.7. The basic landscape and soil parameters which control the accumulation of As, Bi, W, Mo, Pb and Zn is the type of land use, as well as the physical and chemical properties of storage media including the amounts of oxides of Fe, Mn and the pH value.



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**Assessing the role of placer mines in sediment delivery to the Tuul River (Mongolia)**

*Jan PIETRON, Jerker JARSJÖ (Sweden)*

Anthropogenic changes in natural landscapes alter the hydrological and sedimentary regime of river basins. Many of those changes occur in relatively inaccessible, unmonitored parts of catchments, such as the Zaamar region (downstream Tuul River, Mongolia). Hence, commonly used methods and models for estimation of changes in sediment yields and sediment deliveries at such locations are not applicable due to lack of required long-term data. To assess the impact of placer mines (Zaamar Goldfield) on sediment delivery to the Tuul River we develop an area-weighted nested catchment approach. We base our result on snapshot in-stream measurements of sediment loads and GIS analysis of the case study area. Results of our approach are also compared with popular RUSLE-based empirical sediment delivery models. This approach may facilitate impact assessment of sparsely monitored, human-impacted hydrological systems.



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# The Role of Urban Areas for IWRM Implementation in Mongolia: Experiences from Catchments of the Kharaa, Tuul and Orkhon Rivers

*Daniel KARTHE (Germany)*

Mongolia is the most sparsely settled country in the world. Therefore, one would not expect urban areas to play a key role in the context of IWRM implementation. However, this view is definitely not appropriate for the river basins impacted by the country's three largest cities, Ulaanbaatar, Erdenet and Darkhan. In Mongolia, urbanization is a phenomenon that started largely in the second half of the 20th century, when cities were founded as bases for industrial production and mining operations. Today, roughly half of Mongolia's population lives in Ulaanbaatar (1.24 million inhabitants), with Erdenet and Darkhan (about 83.000 and 75.000 inhabitants, respectively) following next. Within the basins of Northern Mongolia's large rivers, these cities were found to be hot spots of heavy metal emissions (linked to mining, industry, traffic and the combustion of coal in periurban 'ger areas') as well as major sources of nutrient influx into rivers caused by a lack of wastewater treatment. Rivers downstream of the cities as well as local groundwater resources show clear signs of urban emissions, leading to a deterioration of local drinking water resources and adversely affecting the riverine aquatic ecosystems. However, cities are also characterized by much higher local water consumption than their rural hinterlands. This is not only caused by a higher concentration of population and economic activities, but also by ineffective water supply systems leading to distribution losses and water wastage. Experiences from a major research and implementation project in Darkhan show that urban water management in Mongolia needs to take into account (1) the supply and discharge side; (2) the differences between densely settled and centrally supplied urban core areas and informal ger areas without central water supply or waste water collection; (3) decision making processes under data-scarcity and in a dynamically changing political and socio-economic environment; and (4) a river-basin wide perspective, integrating both upstream areas of water generation and the ecological and population needs of downstream areas.



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## Urban and Mining Geochemical Impact on Aquatic Systems of the Selenga River Basin

*Mikhail LYCHAGIN, Sergey CHALOV, Galina SHINKAREVA (Russian Federation)*

The transboundary Selenga River flows from the mountainous part of Mongolia through the Republic of Buryatia (Russia) to the Baikal Lake. In recent decades, the river basin experiences increasing technogenic influence, especially in urban and mining areas. Capitals of Mongolia and Buryatia (Ulaanbaatar and Ulan-Ude, respectively) can be attributed to the major sources of urban pollution. Cu-Mo mining and processing plant in Erdenet, as well as gold fields in Boroo and Zaamar present main sources of mining pollution in Mongolia, since W-Mo plant in Zakamensk can be considered as the principal source of pollution in Buryatia. The research is based on field and laboratory studies 2011-2014, which included sampling of water, suspended matter and river sediments, analysis of heavy metals (HM) and other pollutants content, and main features of their spatial distribution. The study showed that geochemical influence of urban areas manifested in increasing geochemical flows of heavy metals and other pollutants. Amount of dissolved HM brought by the Selenga River downstream Ulan-Ude town increases by 2-5 times for Fe, Mn, Ni, Co, Zn, V, U, and by 5-10 times for Pb and Cu. Gold mining impact was seen mostly during relatively short hydrological events, during which large amounts of turbid water flew into the rivers. W-Mo and Cu-Mo mining and processing plants strongly affect the geochemical state of small rivers. HM content in the suspended matter of Modonkul River below Zakamensk mining area increases by 1-2 orders of magnitude. Khangol River downstream mine-mill complex Erdenet had sulfate content about five times greater, and copper content 50 times greater than the background values.



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# Impacts of climate and socio-economic change on water quality in the Selenga river basin: a model-based scenario analysis

*Marcus Friedrich MALSY, Martina FLÖRKE, Joseph ALCAMO, Dietrich BORCHARDT (Germany)*

Increasing water pollution is one of the main global topics causing risk to human health, biodiversity, and food security. Here, anthropogenic water uses e.g. irrigated agriculture and mining intensify salinization processes of land and water resources, which can limit the suitability of water for drinking, agricultural and industrial purposes, and therefore pose a risk to human health and ecosystem status. Hence, not only the quantity of irrigation water is of importance for growing crops but also its quality, which may further reduce the available resources. River discharge plays a crucial role due to the dilution potential, especially in semi-arid to arid regions and in terms of seasonal variability. In this study, the large scale water quality model WorldQual was applied to simulate recent total dissolved solids (TDS) loadings and in-stream concentrations from point and diffuse sources as proxy for salinity to get an insight on potential environmental impacts as well as risks to food security. Furthermore, hotspot regions with high chloride potentials and therefore insufficient water quality for aquatic biodiversity are identified. For this purpose, model simulations were conducted for the year 2010 to show the recent status of surface water quality and identify main causes of pollution. Our results show that salinity hotspots mainly occur in combined irrigation industrialized regions (e.g. mining) as both are the dominant sectors contributing to water abstractions as well as TDS loadings. Additionally, large urban areas are initially loading hotspots and pollution prevention becomes important as point sources are dependent on sewer connection rates.



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**Conceptualizing a willow based wastewater treatment system for ger areas in Darkhan, Mongolia**

*Katja WESTPHAL (Germany)*

In Mongolia, the discharge of insufficiently treated wastewater to the receiving environment due to poor connection rates of informal ger areas to wastewater facilities is a significant problem. To address nutrient emission problems as well as hygiene issues, we investigated the potential of willow vegetation filters in the Kharaa River Basin in Mongolia. Due to the satisfying purification capacity and operation of a pilot plant operating as a trial system, willow vegetation filters are considered to be suitable systems for very cold regions like Mongolia. However, lined systems modeled on the pilot plant's design are expensive on a large scale basis. In order to identify an alternative, three scenarios for the model village of Khongor were developed considering possible designs, sizes and costs. Based on various criteria open evapotranspirative vegetation filters were identified as the most appropriate willow vegetation filter type. These systems are not lined and allow some percolation of irrigation water into deeper soil zones. Decisive criteria are very low life cycle costs, minimum health risk by subsurface irrigation, high operation reliability and comparatively low land requirements.



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# The redistribution water and substance runoff through the main channels the Selenga river delta

*Elena ILICHEVA, Maksim PAVLOV (Russian Federation)*

The main results of research are redistribution of water flow and sediment load in the channels and sectors of the Selenga River delta, obtained on the basis data comparison and processing of different years and the actual experimental studies. During the observation period (2003-2014 years) the flow distribution is unstable and depends on the phase of the hydrological regime and the period of water in a river basin. The general tendency of the distribution of flow is directed into the marginal channels. The erosion and accumulation process has an important role, which is manifested in the changes of channel topography and the altitude and slope of the channel. The main source of sediments in the river flow are sandy sediments of Late Pleistocene terraces and gravel of more ancient formations, which river erodes from the bifurcation node and upstream, and a lesser extent is the material brought from the catchment area. By the results of grain-sizes survey the map of the distribution channel alluvium was created. The tendencies of grain-sizes redistribution were obtained from the top of delta to the mouth. A map displays accumulation-erosion activities in the channels.



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# The role of floods in sediment dynamics in Selenga river basin

*Anna ROMANCHENKO, Sergey CHALOV (Russian Federation)*

Suspended sediment transport during the freshet period was investigated in the Selenga river basin. Event sediment transport and sediment yield were studied for about 160 periods of increased discharges at the 6 gauging stations. Relations between sediment concentration (S) and water discharge (Q) studied by analyzing temporal graphs, which can be different forms and types. Many factors, summarized below, affect S-Q relations. Different sources of river nourishment, different erosion factors, propagation velocity of discharge and sediment load waves over the hydrographic network are the main factors governing nonlinear relations between discharge and sediment concentration. The most floods characterized by clockwise hysteresis when S-graph and Q-graph peaks pass synchronously through the gage, but skewness for water discharge is greater than that for sediment concentration. For the studied gauging stations floods impact on sediment transport form from 52 to 99 % of total annual load. The highest percentage of sediment load was obtained for high-water years, the lowest - for the low-water. Diurnal variations of sediment load were investigated for two gages situated at mountain (Orhon) and sub-mountain (Khara) parts of the basin. Variations of the sediment load during the short-term hydrological events (rain floods) depend on different synoptic situation and geological and geomorphological conditions. The passage of rain floods at Khara river led to small changes of the sediment load, on the contrary, the contribution of rain floods on the mountain river Orkhon corresponds to high increase of sediment load during the shot period.



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# Sediment Dispersal Linked to Hydrodynamics on the Selenga River delta topset, Lake Baikal: Combining Field Data and Morphodynamic Modeling

*Jeff NITTROUER, Tian Yang DONG, Maksim PAVLOV, Gary PARKER, Brandon McElroy (USA); Elena ILICHEVA (Russian Federation)*

The Selenga River delta, Lake Baikal, Russia, represents a unique end-member delta because the system is positioned along the margin of the deep-water Lake Baikal, and therefore represents the world's only modern shelf-edge delta. Here we present research that investigates the morphodynamics of the Selenga delta topset, with the goal of this work to evaluate the processes that control the dispersal of sediment across the delta to the adjacent lake. The Selenga delta topset is characterized by three active lobes that receive varying amounts of water and sediment distributed among seven primary channels and some additional minor channels. Two field expeditions were undertaken during July of 2013 and 2014, to measure the sedimentological and hydrological characteristics within these distributary channels. Single-beam bathymetry data, side-scan sonar data, sediment samples, and aerial photographs were collected to better constrain the spatial variability of 1) channel geometry, 2) bedform size, and 3) grain size of the channel bed sediment and adjacent banklines. Analyses of the data are used to show that the delta possesses downstream sediment fining, whereby channel bed sediment diameter decreases by two orders of magnitude over approximately 30 kilometers, from a predominantly gravel and sand mixture near the delta apex, to silt and fine sand at the delta-lake interface. The gravel-to-sand transition varies spatially amongst the main distributary channels in accordance with their respective water discharge. To build on this relationship, the sediment transport capacity for each of the main distributary channels is calculated by combining measured water discharge and channel dimensions with hydraulic relationships, and estimating boundary shear stress. The results of this analysis indicate that the relative shear stress amongst the channels varies linearly with the downstream displacement of gravel. Interestingly, the data indicate that backwater hydrodynamics, operating as the primary hydrodynamic factor influencing sediment grain size on many river-delta systems, does not seem to have a major influence on the Selenga delta sediment dispersal. Instead, we hypothesize that the highly dynamic channels produce patterns of sediment transport and deposition that are sufficient to suppress backwater hydrodynamics. The downstream grain-size sorting arises primarily due to the bifurcating channel network that partitions water, thereby reducing sediment transport capacity.



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**Rainfall-runoff modelling in Selenga river basin: building the ECOMAG model parameter database**

*Vsevolod MOREIDO (Russian Federation)*

The Selenga river basin is characterized by various water runoff generation landscape patterns, ranging from high mountainous areas to low steppe floodplains. The distributed hydrological model ECOMAG is designed for river runoff modelling with respect to such diversity. It describes processes of snow accumulation and melt, rain and snowmelt water infiltration into freezing and thawing soil, evapotranspiration, overland, subsurface and channel flow accounting for physical properties of watershed landscapes, soil, vegetation and topography.. The current work was aimed at binding together data comprising Russian and Mongolian long-range weather and river gauging time series, remote sensing data, land-use and soil maps, field campaign data, water quality data, etc. to use it as parameters and forcing of the ECOMAG model. The collected data was intended to be used by several workgroups, hence a distributed GIS database was constructed to grasp the diversity of elevation, soil, landscape and landuse conditions in the Selenga river basin. The database was implemented as a web-based multi-user application built with geomixer web gis tool.



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# The Influence of urban settlement and mining activities on water resources in northern Mongolia

*Gunsmaa BATBAYAR (Germany)*

Aim of this study is assess the presence of water quality in Northern Mongolia. In this study we collected 86 water samples from May to July in 2014. In this paper we are presenting the preliminary result of the study. The water samples were analyzed in Central geological laboratory of Mongolia and Helmholtz Centre for Environmental Research – UFZ Central Laboratory for Water Analytics & Chemo-metrics in Magdeburg, Germany. Water quality varied in rivers, shallow and deep wells due to bedrock differences and geochemical weathering processes, anthropogenic pollution, climate effects such as from evaporation and precipitation. Study shows that the potential impacts on water resources from mining, industrial and urbanization activities. More wide-ranging and long term study is a significant for public health issue in that region.



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# Interpretation of aquatic vegetation using hyperspectral images in terms of heavy metals accumulation

*Mikhail TARASOV (Russian Federation)*

The Leman-Baikal project is an international Swiss-Russian research in the field of limnology, geochemistry and land-water interfaces [1]. The project goals include investigation of processes of heavy metal accumulation in aquatic vegetation in river deltas. The main method of the study is simultaneous collection of airborne wide-area and ground-truthing data. To collect remote sensing data a Headwall Photonics Micro Hyperspec VNIR camera (250 bands, 400-900 nm) was used. At the same time the ground-truthing team collected samples of river water, suspended matter and aquatic vegetation. From the literature sources [2, 3] and in previous studies [4] it has been found that each plant species preferentially accumulates specific heavy metals. In this case macrophytes were taken to identify species composition and heavy metals concentrations. Hyperspectral images from Headwall camera were geometrically and radiometrically corrected. Then a mosaic from images was built over the area of the Selenga river delta. To classify aquatic vegetation in the delta area ground-truthing points were used. The main vegetation species are the following: reed, water-lily, watermilfoil and pondweed. Supervised classification of the image mosaic enabled to estimate areas occupied by each type of the studied vegetation. Heavy metals concentrations in aquatic plants were estimated using geochemical analyses. We used this information to calculate amounts of accumulated metals in main plants species of the delta area. Using data of heavy metals inflow into the delta area in dissolved and suspended forms we can estimate approximate percentage of metal filtration through the delta.



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## Mining industry impact on suspended sediment concentration of the Selenga River Basin

*Ekaterina PROMAKHOVA, Sergey CHALOV (Russian Federation)*

There are a lot of mineral deposits are developed in the Selenga River Basin, in particular non-ferrous metals and coal. Ore washing and discharge of sewage increase suspended sediment concentration (SSC) of river water. The impact of mining on the SSC was studied during field expeditions in 2011-2014. Researches were conducted on the Zaamar placer gold fields in the Tuul River valley and Boroo placer gold fields in the Boroo River Basin, at the Erdenet copper-molybdenum mining and processing works on the Khangal River, at the Dzhidinsky tungsten-molybdenum combine in Zakamensk on the Modon-Kul River (closed in 1998) and on the Sharyn Gol brown-coal field in the Sharyn Gol River Basin. Extraction of placer gold increases the SSC in the Tuul River by 1,6 times (to 136 mg/l) and by 2,7 times (to 289 mg/l), in the Boroo River by 1,6 times (to 64,2 mg/l) and by 8,8 times (to 212 mg/l) during low water stage and floods respectively. In the Khangal River Basin the SSC multiplies 17,5 times (to 266 mg/l) below a tailings pond. 15 years later after closure of Zakamensk enterprise passing of rains still leads to washing away of the mineral particles through a tailings dam, for this reason the SSC growths in the Modon-Kul River in 13-fold (to 148 mg/l). The greatest increase in the SSC by 37 times (to 455 mg/l) is recorded in the river Sharyn Gol. Discharge of wastewaters from the mining enterprises into rivers causes increase the amount of suspended fine fractions (clay and silt) from 75 to 95-99%. Along the Tuul River downstream from the Zaamar Goldfield reduction of the SSC by 1,7 times occurs due to decreasing the transporting capacity. For other studied small rivers the SSC decreases only after a confluence with larger rivers. This study is financially supported by Russian Fund for Basic Research (project 14-05-31351 mol_a) and Russian geographical society grant “Expedition Selenga–Baikal”.



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# A new smoothing-based atmospheric correction: application to classification on Léman/Baïkal campaign data

*Manuel CUBERO-CASTAN (Switzerland); Mikhail TARASOV (Russian Federation)*

Léman-Baïkal project was originally designed to conduct a comparative study of the functioning of Geneva lake in Switzerland, also called Léman lake, and Baïkal lake, in Russian Federation. This study includes analysis of hydrological processes, lake energy balance and processes pertaining to the land-water and air-water interfaces in lakes. The key parameter in those studies is linked to the reflectances, i.e. the optical properties of the materials composing an observed scene. To retrieve these ground material reflectances from measured radiances, a process called atmospheric correction is applied. Many atmospheric correction methods have been designed over the last three decades but they either assume available reflectance spectra measured in the field or atmospheric profiles. When such information is not available, the atmospheric correction can be performed using the QUick Atmospheric Correction (QUAC) method. This method assumes a large variability of the materials within the observed scene. In the case of Léman Baïkal hyperspectral images, most of the images are mainly composed just by water and vegetation. To tackle the QUAC limitations, we design a new semi-supervised atmospheric correction called the Smoothing Technique for Empirical Atmospheric Correction (STEAC). The STEAC aims at estimating reflectances stable regarding the scene variability. In this study, we apply supervised classification (Spectral Angle Mapper) to images with and without atmospheric correction using the same regions of interest. Overall classification accuracy of data with STEAC method was more than three times higher than with QUAC method or without any atmospheric correction (72% vs 20% and 17%). Furthermore, half of studied classes could be identified only using the STEAC method.



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# Climate Variability and Predictability

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- The modified ensemble Kalman particle filters for data assimilation with nonlinear measurement functions

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case study for Nebraska, United States

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- Extreme precipitation over the Crimea

  *Elena VYSHKVARKOVA (Russian Federation)*

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  *Antonina SAVVINOVA, Victoriia FILIPPOVA, Alena SVINOBOEVA (Russian Federation); Trevor FULLER (USA)*

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  *Nina EVSEEVA, Larisa FILANDYSHEVA, Ekaterina SAPYAN, Tatiana ZHILINA, Zoia KVASNIKOVA (Russian Federation)*

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  *Vera VINOGRADOVA (Russian Federation)*

- Variability air-sea turbulent heat fluxes in CMIP5 model simulations and observational datasets

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- Influence of Siberian autumn snow cover anomalies on the Siberian High

  *Yuliya MARTYNOVA, Vladimir KRUPCHATNIKOV (Russian Federation)*

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  *Elena CHERENKOVA (Russian Federation)*



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- Heat budget of the upper mixed layer in the North Atlantic

  *Pavel SUKHONOS, A.B. POLONSKY (Russian Federation)*



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**New perspectives and challenges in ENSO research**

*Dake CHEN, Tao LIAN, Youmin TANG, Xunshu SONG (China (Beijing))*

El Niño–Southern Oscillation (ENSO) is by far the most energetic and influential short-term climate variability on our planet; and it has been a hot topic of oceanic and atmospheric research over the last three decades. However, despite the tremendous progress in the theory, observation and prediction of ENSO, our understanding of this important phenomenon is still far from complete and there are considerable debates even on the basics such as the diversity and genesis of ENSO. Here we review some recent advances and remaining challenges in ENSO research. In particular, based on our newly obtained results from data analyses and model experiments, we provide some new perspectives on the classification of ENSO and associated mechanisms, the interaction of ENSO with global warming, and the potential predictability of ENSO.



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**The role of atmosphere intraseasonal disturbances in El Niño generation**

*Daria GUSHCHINA, Boris DEWITTE (Russian Federation)*

El Niño Southern Oscillation (ENSO) is one of the most prominent patterns of climate variability at interannual scale. It influences the weather and climate conditions in wide areas from the tropics up to the mid-to-high latitudes. The ENSO evolution and mechanisms have been widely investigated, nevertheless key questions remain unresolved, in particular regarding its irregularity and strong variability between the events. Here the focus is on the atmospheric disturbances of intraseasonal timescale (ITV) and its relationship with the two types of El Niño, the Eastern Pacific El Niño and Central Pacific (or Modoki) El Niño. It is suggested that anomalous westerlies associated to the Madden-Julian oscillation (MJO) induce the oceanic Kelvin wave in March-April preceding El Niño in the Western Pacific. The intensification of equatorial Rossby waves (ER) in June-July in the central Pacific serves the maintenance for Kelvin wave dissipating along its way through the Pacific. The latter being responsible for anomaly propagation along the equatorial Pacific and resulting in El Niño conditions. It is shown that MJO and equatorial ER activity have a distinct characteristics during the two types of El Niño.The most striking difference is that during conventional El Niño the MJO and equatorial Rossby waves activity are precursor signals, acting as a trigger of the event while during Modoki El Niño they contribute mostly to its persistence once it has appeared. The work is supported bu RFBR, grant No.15-05-06693.



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**La Nina events space classification and their typical features**

*Olesia MARCHUKOVA, Elena VOSKRESENSKAYA (Russian Federation)*

The aim of paper is to classify the La Nina events according to the space distribution of sea surface temperature (SST) anomalies. Monthly global HadISST datasets for 1870 to 2013 on the 1° x 1° spatial grid and South Oscillation index (SOI) were used for analyses. Statistical, composite, cluster analysis are applied as the main methods in present work. SST anomalies indices for Nino3.4 (5S-5N and 170-120W) and Nino1+2 (0-10S and 90-80W) regions in the equatorial Pacific were calculated from the fields of the HadISST data set and were used to select La Nina events. As a result, 30 La Nina events in 1870-2013 were selected. Next this events were classify using hierarchical method of the cluster analysis. The classification has found two types of La Nina. They characterised by differencies in the location of negative SST anomalies maximum, the intensity and of SOI index intensity. SST anomalies of the first La-Nina type (named "East Pacific" (EP) event) generate in the eastern Equatorial Pacific near the coast of Peru and Ecuador. The second type, named the Central Pacific (CP) La Nina because its SST anomalies are generate in the central Equatorial Pacific. Note, that after 1970s CP La Nina type occurre more frequently than EP events. Region manifestations of classified La Nina types in the interannual anomalies of hydrometeorological and oceanographic characteristics are identified and described.



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## Hadley and Walker cells circulation anomalies during two types of El-Nino events

*I.V.SAZHIN, I.V.ZHELEZNOVA (Russian Federation)*

El Nino Southern Oscillation is one of the most drastic climate anomalies occurring in tropical regions and influencing weather and climate in many remote regions. It is characterized by the warming of equatorial Pacific and important changes of atmosphere circulation. Researches of the last decade revealed that two types of El Niño exist differencing by the spatial localization of sea surface temperature (SST) anomalies - Central Pacific or Modoki and East Pacific or canonical El Niño. The remote response induced by SST anomalies is mostly transport in the atmosphere through the vertical circulation cells: zonal Walker circulation and meridional Hadley circulation. Here the focus is on the modification of vertical circulation associated to the two different types of El Niño. The divergent part of the wind and vertical velocity analogue are used to construct the vertical circulation cells. ERA-Interim Reanalysis data is used for the analysis of modern climate and GFDL-ESM2M model output for assessment of changes associated to the global warming. It is argued that canonical El Nino is associated with the Pacific Walker circulation, western Pacific Hadley circulation, and the Atlantic Hadley circulation weakening, whereas the eastern Pacific Hadley circulation is strengthened. During Modoki El Niño Atlantic Hadley circulation intensifies. This type of El Nino has a greater effect on vertical circulation than canonical El Nino in Tropical North Atlantic (TNA) and Pacific-North American (PNA) teleconnection patterns. Further the anomalies of vertical circulation are used to explain the difference in air temperature and precipitation response to the two types of El Niño.



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## New Methods in Tornado Research

*James B. ELSNER (USA)*

How climate change might affect tornadoes remains an open scientific question. Climatological studies are often contested due to inconsistencies in the available data. In this talk I show how statistical methods can be used to overcome some of the data limitations. I show how spatial aggregation facilitates the application of new flexible models for testing physical hypotheses about what influences tornado occurrence. A model is fit to data aggregated at the level of state counties to examine whether terrain roughness is related to tornado frequency and whether there are differences in tornado activity by County Warning Area (CWA). A key finding is that tornado reports increase by 13% for a two-fold increase in population across Kansas after accounting for improvements in rating procedures. Independent of this relationship tornadoes have been increasing at an annual rate of 1.9%. Another finding is the pattern of correlated residuals showing more Kansas tornadoes in a corridor of counties running roughly north to south across the west central part of the state consistent with the dry-line climatology. The model is improved by adding terrain roughness. The effect amounts to an 18% reduction in the number of tornadoes for every ten meter increase in elevation standard deviation. Applications of these methods will help grow the nascent field of tornado climatology.



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# The Early-1990s Climate Shift in the Pacific: Its Linkages to ENSO, Decadal Drought Pattern in China, and Atlantic Multi-decadal Oscillation

*Jin-Yi YU, Houk PAEK, Chengcheng QIAN (USA)*

There is substantial evidence that significant changes occurred in broad areas of the Pacific in the early 1990s, including the shift of the location of El Niño events from the eastern Pacific to the central Pacific (CP). Observational analysis and coupled model experiments are conducted to show that the early-1990s climate shift is linked to a phase change of the Atlantic Multi-decadal Oscillation (AMO) that occurred at about the same time. The recent emergence of the CP El Niño can be attributed to this AMO phase change via the following chain of events: a switch in the AMO to its positive phase in the early 1990s led to an intensification of the Pacific Subtropical High. The intensified High resulted in stronger-than-average background trade winds that enhanced the Wind-Evaporation-SST feedback mechanism, strengthening the subtropical Pacific coupling between the atmosphere and ocean, making the subtropical Pacific precursors more capable of penetrating into the deep tropics, and ultimately leading to increased occurrence of the CP El Niño events. Evidence is also found that the typical drought pattern in Eastern China diminished after the early-1990s climate shift and is replaced by a new pattern that is produced by the AMO via a Eurasian wave train emanating from North Atlantic to China. This study indicates that the early 1990s is a time when the Atlantic began to exert a stronger influence on climate over East Asia and a large part of the Pacific.



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**The interdecadal change of ENSO impact on wintertime East Asian climate**

*XiaoJing JIA, Hai LIN (China (Beijing))*

The interdecadal change of the winter mean SAT over East Asia (EA) and its relationship to ENSO are investigated using both observational data and a simple general circulation model. The second empirical orthogonal function (EOF) mode of the SAT (SAT-EOF2) over EA explains a large part of variance of the SAT and can represent the variation of the East Asian winter monsoon. A positive SAT-EOF2 is represented by a significant cooling extends from 60N to the tropics and an abnormally warming over the high-latitude EA. A clear climate shift of SAT-EOF2 is observed in the mid-1980s. Two subperiods are discussed separately which is before (1957 to 1982, P1, hereafter) and after the shift (1986 to 2010, P2, hereafter). A positive SAT-EOF2 is closely related to La Nina type SST anomalies in P2 whereas no significant relationship is observed between them in P1. Further examination shows that over the tropics, the La Nina related cyclone over the western tropical Pacific is more pronounced in P2 than that in P1 which is a result of an increase of the ENSO-related SST and precipitation anomalies. Over the midlatitudes, there is pronounced barotropic anticyclone atmospheric response to the La Nina forcing in P1 centered southeast of Japan resulting from the interdecadal changes of the mean flow. The strong northerly wind along the west flank of the negative height anomalies brings cold air from the high-latitudes along the east coast of EA that causes cooler than normal SAT over EA and the surrounding oceans in P1.



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**Climate change sensitivity analysis for agriculture in a region with an extreme thermal range**

*Chris R. DE FREITAS (New Zealand); Elena GRIGORIEVA (Russian Federation)*

Climate is a key factor in agriculture. Sensitivity analysis circumnavigates the problem of uncertainty of future climate and informs planning decisions without having to know precisely the magnitude of change that will occur. The current study is an update of our earlier work that uses growing degree-day (GDD) sensitivity analysis as applied in the thermally extreme climate of the Russian Far East. It examines spatial patterns in these data using mean daily climate data for 50 stations over a 30-year period. Daily maximum and minimum air temperatures are used for calculating GDDs using threshold base air temperatures of 0, 5, 10 and 15°C, with a high-temperature threshold cut-off of 30°C. Sensitivity to changed thermal conditions of +1, +2 and +3 oC are examined using a sensitivity index (GDDSI) defined as the percentage change in GDD for each of three warming scenarios. The larger the GDDSI the more sensitive the climate from crop growing. The results show GDDSI decreases from north to south of the study area, but the mean GDDSI varies considerably from one location to another. Marginal thermal conditions are observed in the north. In most cases, sensitivity does not increase significantly as warming rate increases. The higher the base threshold, the higher the sensitivity. The highest sensitivity is for GDDs at threshold 15oC at Okhotsk in the far north of the study area. The mapped results are useful for identifying areas of high sensitivity to climate change as well as the magnitude of the potential impact of change.



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**Interannual variability of cloudiness from the end of the 19th century in the Atlantic Arctic**

*Alexander CHERNOKULSKY, I.N. ESAU, O.N. BULYGINA, I.I. MOKHOV, V.A. SEMENOV (Russian Federation)*

An analysis of cloud cover variability in the Atlantic part of the Arctic (the Norwegian, Barents and Kara Seas) based on long-term surface observations from Norwegian and Russian meteorological stations was carried out. We found that total cloud fraction (TCF) had a maximum in the middle of the 20th century during the early 20th century warming (E20CW) and a minimum during the cooling of 1970s. TCF tend to increase in the last decades. However, values of TCF are still less in the present climate compare to E20CW according to the analyzed station data. The cold 1970s are characterized by high fraction of clear sky reports in the data sets. We also found that the occurrence of overcast conditions decreases while the occurrence of reports with broken clouds increases from the beginning of 1930s. These tendencies are revealed for all seasons but they are the most pronounced in autumn. Because of clouds tend to warm surface air, the revealed cloudiness changes are consistent with a seasonal asymmetry of the early 20th century warming. Thus, clouds effects may be one of the major distinction between two warmings of the 20th century in the Arctic.



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## Synoptic aspects of winter warming in the Arctic

*Kirill TUDRIY, E.K. SEMENOV, N.N. SOKOLIKHINA, M.V. SHCHENIN (Russian Federation)*

Using analysis of everyday weather maps and atmospheric sounding data in the Arctic the synoptic mechanisms of temperature anomalies formation during winter 2011-2012 in the Western Arctic were considered. Obtained typical schemes of macroscale atmospheric circulation adjustment shows how it led on the one hand to intensive advection of warm air from Atlantic to the central part of the Arctic basin and on the other hand to eastern flow formation from Siberia to south parts of Russia and to the Mediterranean countries. Analysis of SST and surface temperature maps showed that positive anomalies of SST in the north of Barents Sea during January-February 2012 reached 5-6 degrees Celsius and anomalies of surface temperature up to 15-20 degrees Celsius. All these indicates a shift of the North Atlantic current (which is an extension of the Gulf Stream) from the Scandinavian coast to the north.



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# Constrasting initial errors that cause a signifcant spring predictability barrier for two types of El Nino events

*Wansuo DUAN, Ben TIAN (China (Beijing))*

In this paper, the spring predictability barrier (SPB) problem for two types of El Niño events is investigated from the perspective of initial error evolution. This is enabled by tracing the evolution of a conditional nonlinear optimal perturbation (CNOP), superimposed on an observing system simulation of two types of El Niño events that act as the initial error with the biggest negative effect on the El Niño predictions. We show that the evolution of CNOP-type errors for CP-El Niño events can be classified into two types: the first are CP-type-1 errors possessing a sea surface temperature anomaly (SSTA) pattern with negative anomalies in the equatorial central western Pacific, positive anomalies in the equatorial eastern Pacific, and accompanied by a thermocline depth anomaly pattern with positive anomalies along the equator. The second are, CP-type-2 errors presenting an SSTA pattern in the central eastern equatorial Pacific, with a seesaw structure of negative anomalies in the east and positive anomalies in the west, and a thermocline depth anomaly pattern with a slight deepening along the equator. CP-type-1 errors grow in a manner similar to an EP-El Niño event and grow significantly during boreal spring, leading to a significant SPB for the tropical SSTA associated with the CP-El Niño. CP-type-2 errors initially present as a process similar to a La Niña-like decay, prior to transitioning into a growth phase of an EP-El Niño-like event. They do not present an evident season-dependent evolution and fail to cause a SPB. For the EP-El Niño events, their CNOP-type errors are also classified into two types: EP-type-1 errors and 2 errors. The former is similar to a CP-type-1 error, while the latter present with an almost opposite pattern. Both EP-type-1 and 2 errors exhibit obvious season-dependent evolution and yield a significant SPB for the tropical SSTA associated with EP-El Niño events. For both CP-El Niño and EP-El Niño, the CNOP-type errors that cause a prominent SPB are concentrated in the central and eastern tropical Pacific. This may indicate that the prediction uncertainties of both types of El Niño events are sensitive to the initial errors in this region. It is implied that the errors in this region mainly influence the amplitude of EP-El Niño events and the spatial structure of CP-El Niño events. This region may represent a sensitive area for the targeted observation of the two types of El Niño events.



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# The modified ensemble Kalman particle filters for data assimilation with nonlinear measurement functions

*Zheqi SHEN, Youmin TANG, Yifan WANG (China (Beijing))*

The ensemble Kalman particle filter (EnKPF) is a combination of two Bayesian-based data assimilation algorithms, namely, the ensemble Kalman filter (EnKF) and the sequential importance resampling particle filter (SIR-PF). It was recently introduced to address non-Gaussian features in data assimilation for highly nonlinear systems, by providing a continuous interpolation between the EnKF and SIR-PF analysis schemes. In this study, we first extend the EnKPF algorithm by modifying the formula for the computation of the covariance matrix, making it suitable for nonlinear measurement functions (we will call this extended algorithm nEnKPF). Further, a general form of the Kalman gain is introduced to the EnKPF to improve the performance of the nEnKPF when the measurement function is highly nonlinear (this improved algorithm is called mEnKPF). The Lorenz '63 model and Lorenz '96 model are used to test the two modified EnKPF algorithms. On this basis, we further apply these extended EnKPF algorithms in the data assimilation of real oceanic general circulation model (OGCM) of actual observations. A comparison between these methods and EnKF is also conducted using this model.



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## The remote response to the two types of El Nino

*Irina ZHELEZNOVA, Daria GUSHCHINA (Russian Federation)*

El Niño - Southern Oscillation (ENSO) is one of the most striking anomalies in the climate system of our planet. El Niño appears in two different flavors: the canonical El Niño, which is characterized by the maximum SST anomalies in the eastern Pacific, and El Niño Modoki with maximum anomalies localized in the center of the Pacific Ocean, near the date line. The remote response to the two types of El Niño is drastically different, being opposite in some areas. The intensity of global circulation response to the El Niño Modoki is larger as compare to the canonical El Niño. Meanwhile the spatial structure of zonal atmospheric circulation response to the two types of El Niño is similar. It is characterized by the poleward propagation of the signal from the equatorial and tropical latitudes. El Niño is associated with the intensification of western currents in mid latitudes and equatorial belt in the low troposphere and decreasing of the easterlies in tropics. Based on the regression analysis the air temperature and precipitation anomalies observed during canonical and Modoki El Niño are documented. The most striking difference of the response is observed in the equatorial Pacific, Indonesia, in the south of Japan, Korea and the west coast of China, Central and northern South America. In some areas the significant anomalies appear during only one type of El Niño. To explain the origin of different remote response in the specific areas the analysis of anomalous regional circulation patterns and modification of vertical circulation cells are involved. The reported study was supported by RFBR (Russian Foundation for Basic Research), research project No. 15-05-06693.



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# Comparision of Earth rotation and climate change

*Leonid ZOTOV (Russian Federation)*

We compare Earth rotation with climate change characteristics. Similarities are found in natural 70 and 20-year variations of global Earth temperature, sea level, length of day (LOD), and Chandler wobble amplitude. Possible causes are discussed. Similarities are used to improve predictions.



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# Decadal variability of global precipitation during 1979-2008

*Xiaofan LI, Guoqing ZHAI (China (Beijing))*

In this study, the decadal trends of global precipitation are calculated and compared using the CMAP, GPCP and NCEP/NCAR reanalysis monthly precipitation data over the past 30 years from 1979 to 2008. The major results include the followings: (1) The decadal trend of annually and globally averaged precipitation depends on a decreasing trend for the CMAP data, a flat trend for GPCP data, and an increasing trend for the reanalysis data. (2) The analysis of horizontal distributions of differences in temporally averaged precipitation between the second (1993–2008) and the first (1979–1993) 15 years shows that the decreasing trend in the CMAP data is associated with the reduction in precipitation over the oceans. The further analysis of difference in zonally averaged precipitation rate reveals the increased precipitation rate in both the Tropics and mid-latitudes. The reduction in precipitation over the oceans is significantly weaker in the GPCP data than in the CMAP data, which shows the flat trend in the global GPCP data. The increasing trend of global precipitation average for the reanalysis data is associated with the increase in precipitation off the equator as well as in the mid-latitudes. (3) The further analysis of precipitation statistics reveals that the decreasing trend for the CMAP data is associated with the reduction in high precipitation. The flat trend for the global GPCP data corresponds to the offset between the decrease in low precipitation and the increase in high precipitation. The increasing trend for the reanalysis data is related to the increase in high precipitation.



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**The analysis of temporal variation of ultraviolet in Iran**

*Manuchehr FARAJZADEH Asl, Yousef Ghavidel RAHIMI, Mehdi Ardehirhi KALHOR (Iran)*

The increase of cancer and public health problems is one of important factor to consider to ultraviolet radiation in recent years. In order to present an index of hazards threshold for warning system is very vital. In this paper the ultraviolet data of Esfahan station as representative of Iran selected and analyzed to detect temporal variation. The data period are 1990-2000 and statistical method were used to analysis of daily, monthly seasonal and annually variations. The result showed maximum and minimum of hazard index are 11.5 in initial of summer and 0.5 in medium of winter respectively. Also the trend analysis for recent years indicated that the values of ultraviolet radiation had positive stat in the spring and in other season had a negative state. In daily scale the maximum intensity occurred between 10 AM and 16 PM that in the most of years is more than 3.



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# Identifying extreme precipitation character and variability in Mediterranean precipitation regime region

*Faize SARIŞ (Turkey)*

Extreme precipitation climatology of Mediterranean regime region of Turkey were analysed by using 5 precipitation indicators namely (1)simple daily intensity (SDII), (2) number of maximum rainy days, (3) highest 5-days precipitation amount, (4) 75th percentile of wet day amounts (R75) and 90th percentile of wet day amounts (R90). Daily precipitation data were used recorded at 33 locations along the west and south coastal region of Turkey for the period 1963-2012 (50 years). In Mediterranean regime region, the number of days (defined as extreme) is less than 30 and 15 at annual scale. However, during these days contribution of precipitation is almost half of the total precipitation amount for each station. This situation indicates and reconfirms the significance of heavy rainfall events and precipitation intensity for Mediterranean region. More specifically, the southwest part of the Mediterranean region (coastal) has the highest index values of extreme precipitation. Regarding the long-term changes in the extreme precipitation series some important results were found. The number of rainy days has been widely decreasing for the most of the stations during the period 1963-2002. This situation implies a shrinking in rainy period. Therefore, there is a pressing need to carry out basin-based studies for Mediterranean precipitation region and analyse impacts of changing precipitation character (amount, duration, frequency, intensity and periodicity) on hydrological systems. Intensification in seasonality of precipitation means severe drought for summer period, because precipitation variability not only alter surface flow but also affect groundwater regime. Therefore, significant problems regarding domestic and agricultural usage of water can occur. The extreme precipitation pattern of this regime region causes many hazardous events, such as floods, mud flow, landslide and erosion. These events can have serious damages on transport systems, urban areas, tourism activities, dams, agriculture and also negatively affect natural habitats.



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**Trends of climate change in the Baikal region, Russia**

*Sergey KIRILLOV, Mikhail SLIPENCHUK, Evgenia KUKANOVA (Russian Federation)*

The Baikal region includes the Republic of Buryatia, Irkutsk Region and Trans-Baikal Territory. Learning of climate change is important because Lake Baikal is a UNESCO World natural Heritage Site. It is the deepest lake in the world and the largest natural reservoir of fresh water. Climate of the Baikal region is sharply continental and associated with large amplitude of annual temperature (near 700C). Regular winter is frosty and clear without precipitation. Most precipitation observed during warm period of the year. The aim of this work is to assess the nature of climate warming in the Baikal region. To study the temporal and spatial dynamics of climate change in this area, we selected 27 regular meteorological stations of ROSHYDROMET. For the Baikal region is a common tendency to increase air temperature on surface. Since 1970, the average increase of temperature had already reached 1°C. However, it should be emphasized that the temperature increase is combination of different directions fluctuations. We made comparative analysis of average monthly temperature dynamics of the warmest month – July and coldest one – January. The average January temperature varies considerably, but a clear trend of increasing or decreasing of the temperature does not sum up. Since 1970, the July temperature had risen up at level of 1.2°C. Since 1990, anomalies have only positive sign for most of the stations. Analysis of the constructed maps of air temperature anomalies for July and January for the period 2000-2012 did not reveal a single spatial feature of formation of anomalies in the region. On some winter maps, the area of Lake Baikal becomes an area of increased anomalies that can be explained by the increase of warming effect of the lake and as a result of late establishment of ice.



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# Long Term Variability Of Temperature Within The Framework Of Modern Non Parametric Test Results In The Context Of Climate Change In Armenia

*Hrachuhi GALSTYAN, Lucian SFICA (Armenia)*

A significant increase in the average values of air temperature has been reported worldwide indicating that the climate is changing. This study intends to evaluate the analysis of temporal and spatial variability of thermal conditions in the Republic of Armenia in the second half of the twentieth century and the first decade of the twenty–first century. This research gauges annual and daily state of air temperature. The study area is Republic of Armenia, where long–term measurements and observations of weather conditions have been performed within the national meteorological services of Armenia (41 meteorological stations). Their daily data of air temperature indicating period of 1961–2012 was implemented in the study. The presence of trends in annual temperature has been assessed by means of autocorrelation function and the Mann-Kendall test searching and aimed to find the presence of change in the long time evolution of temperature.



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# Linking global warming and the soil moisture estimates derived from microwave satellite data: a case study for Nebraska, United States

*Vijendra BOKEN (United States of America)*

In recent years Nebraska had witnessed record-breaking temperatures causing the stakeholder to find reasons for such a warming. Greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, are often blamed for causing temperature to rise. In the case of Nebraska, water vapor which is an additional greenhouse gas appears to have played a role. Aagricultural irrigation is responsible for raising water vapor concentration in the atmosphere through evapotranspiration is . For Nebraska, the irrigated area (exceeding approx. 3.5 million hectares as well as the rate its annual increase (exceeding 10%) has been higher than for any other state in the country due to ample availability of the groundwater. Data would be analyzed at a county level and would relate to soil moisture estimates derived from microwave data available with the Vienna University of Technology, temperature and precipitation collected from the High Plains Regional Climate Center, and irrigated area collected from the United States Department of Agriculture, for the cropping period from 1980 to 2013. The soil moisture estimates for a county would be averaged using a geoprocessing analysis involving ArcMap. The average soil moisture estimates would be regressed against the average temperature for a county over the study period. The variation in the strength of relationship would be examined across counties to study the impact of irrigation on temperature. If the soil moisture and temperature were found strongly related, the farmers could be advised to optimize irrigation in order to restrain global warming that could negatively affect crop production in the future.



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**Assessment of climatic changes in the Asian territory of Russia over the period 1975-2012**

*E.V. KHARYUTKINA, S.V. LOGINOV, I.I. IPPOLITOV (Russian Federation)*

The analysis of temperature and atmospheric pressure fields over the Asian territory of Russia (ATR) was carried out using observational data at meteorological stations. The climatic trends at the end of the XX - beginning of the XXI century for the ATR as a whole as well as for its separate regions (West and Middle Siberia, North East, Primorye, Cisbaikalia and Transbaikalia) were assessed through the comparison of temperature and pressure variability estimates for two time intervals: 1975-2005 and 1982-2012. It was established that climatic changes over ATR during the second period have the tendency to annual average temperature increase, but the warming process is less intense than during the first period. A dominant role in the decrease of the temperature growth rates is played by the winter months when the warming process is changed by the cooling process. Furthermore, there is a tendency to an increase in pressure over the second time interval. The work has been supported by the grant of the RF President MK-5969.2015.5.



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## Extreme precipitation over the Crimea

*Elena VYSHKVARKOVA (Russian Federation)*

The aim of presentation is to study the characteristics of extreme precipitation over the Crimea and the manifestation of Pacific decadal oscillation (PDO) in their climate change. Daily precipitation data observed at 18 standard hydrometeorological stations in Crimea in 1951 – 2009 were used. Two methods were applied for analysis. The first of them is based on the concentration index (CI) estimation (Martin-Vide J., 2004). The second one is the method of extreme precipitation indices (95th percentile). Average and seasonal values of CI precipitation are maxima in Crimean mountain region and in steppe zone of Sea of Azov coastal area. Linear trends are predominantly negative for all seasons over the Crimea. Extreme precipitation level for the whole year and all seasons except summer is characterized by increasing from the North to South, with a peak in the mountains. In summer the extreme precipitation is uniformly distributed over the peninsula, its average values are about 24.5 mm/day. Linear trends of the number of cases of extreme precipitation events in winter season are predominantly negative while in summer season they are positive in southeastern part of Crimea. Negative PDO phase is accompanied by CI increasing on 11 %. Number of cases of extreme precipitation in winter season on 30 % higher in PDO negative phase but in summer season number of extreme precipitation events is on 60 % more in the south-west of Crimean peninsula in positive phase of PDO than in negative one.



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# What are the climatic forces driving regional precipitation disparity in northwestern China in the last millennium?

*Pak Kan CHOI, H. F. LEE, Q. PEI, D. D. ZHANG (China)*

This study aims at investigating the long-term climatic driving factors in shaping the pattern of regional precipitation disparity (RPD) in northwestern China (NW China). We reconstruct precipitation indices of two extensive regions in NW China from historical documentary records in AD 580-1979, in order to find out the RPD of NW China in multi-decadal to centennial time scales, and the climatic forces behind RPD in NW China. Wavelet analysis and wavelet coherence are then utilized to investigate the relationships between climatic forces and RPD. We have found that significant RPD changes are present in NW China during AD 580-1979, and the relationships between RPD in NW China and various modes of atmospheric circulation (Arctic Oscillation, Asian Summer Monsoon, North Atlantic Oscillation, and Pacific Decadal Oscillation) are significant and characterised by a regime shift during the transition from the warm episode to the Little Ice Age in the 14th century. Moreover, we have also found that a long periodicity of El Niño-Southern Oscillation is the most prominent driving force of regional precipitation disparity in NW China at the long-term temporal scales. We believe that the findings can help improve precipitation forecasting in the future.



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**Intensification of the Walker Circulation in the Past 130 Years**

*Tao LIAN, Dake CHEN, Youmin TANG, Chan ZHANG (China)*

Controversial statements have been proposed on whether the Walker circulation is strengthened or weakened in history, mostly due to the inconsistent periods and data source used. In this study, long-term trends of the zonal gradient of sea surface temperature, surface air temperature and sea level pressure in the equatorial Pacific, which are generally used to evaluate the variation of the Walker circulation, are systematically investigated at each pair of years in the past 130 years based on 14 observational and reanalysis datasets. It is found that the trend of the Walker circulation can be heavily modulated by the El Niño-Southern Oscillation (ENSO) event and the Pacific Decadal Oscillation (PDO). Owing to the inconsistent estimations of ENSO and PDO before the satellite era among those multisource datasets, significant uncertainties in the estimation of the Walker circulation are introduced. However, trend with reconstructed archives when ENSO signal is excluded exhibit uniformly strengthening of the Walker circulation. These findings imply that, although the Walker circulation is very sensitive to the calculating period and to the data source, the intensification trend of the Walker circulation is a very robust signal in the past 130 years, proposing extreme cautions about the weakening of the Walker circulation proposed in recent studies.



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# Rainfall Behaviour In Relation To Urban Environment Of Guwahati City, India

*Bimal KUMAR, Sutapa BHATTACHARJEE (India)*

The dynamics of climate can be witnessed in relation to varying topography, surface environmental conditions and prevailing human functionality of an area. Rainfall, one of the most effective climatic instruments, is responsible for shaping the physical and cultural landscapes. Rainfall pattern is thus area specific and changes with any sort of imbalance in its other influencing factors. With rapid industrialization and urbanization across the globe, the urban milieu is found to have a definite impact on the climate. Rainfall behaviour is greatly influenced by urbanization since many of the prerequisites for rainfall are present over the cities including upliftment of wind due to convergence, heat island instability and accumulation of huge amount of hygroscopic nuclei in the atmosphere. Rapid growth of Guwahati, the largest urban center in India's north-east, both in terms of area and population, is making the urban environment more unstable. Although the amount of rainfall in the city due to monsoon remains almost same, it has undergone distributional change with decrease in rainy days and increase in high-intensity rain events due to a variety of factors typical to its dynamic environment. Such change in the rainfall behavior brings about a chaotic situation to the city-dwellers ranging from water scarcity with the drop of the ground water level during the long dry spells to severe urban flooding during the unusual intensive rain events. With this background the paper intends to examine the spatio-temporal variability of rainfall and its associated effects on the basis of meteorological and field data of various localities in Guwahati city.



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**The circulation features of catastrophically hot weather formation in Moscow during summer 2010**

*K.O. TUDRIY, N.N. SOKOLIKHINA, E.K. SEMENOV, A.V. KISLOV, V.D. TUDRIY (Russian Federation)*

The typization of weather conditions and synoptic processes, which led to the formation of the abnormal hot weather in Moscow, was prepared using everyday data archives of GIS Meteo and NCEP/NCAR reanalysis. Conditions of the long-term anticyclone stabilization were considered in detail and the reasons for its regenerations were identified. To obtain blocking anticyclones quantitative characteristics the methodology was proposed to assess the contribution of the planetary vortex advection, advection of vorticity, divergence, vorticity fluxes generated by low - and high-frequency fluctuations and the interaction between them in variations of vorticity. It is shown that the greatest contribution comes from the advection of planetary vorticity, divergence and vorticity flux generated by low-frequency fluctuations. Moreover, the maximum change of the quantitative characteristics in the center of anticyclones begins 6-7 days prior to their gain.



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**Singularities of trend analyses in rainfall and streamflow observations in Mexico**

*Luis BRITO-CASTILLO, Juan RODRÍGUEZ-ESTEVE, Enrique GONZÁLEZ-SOSA, Enrique PÉREZ-CAMPUZANO, José SALINAS-PRIETO, Carlos WELSH-RODRÍGUEZ, María ROMO-AGUILAR (Mexico)*

Linear trend analyses have been a useful tool in revealing the existence of temperature trends in Mexico; trends have been partly associated with regional land use, changes in land cover and changes in large-scale atmospheric flow patterns. While significant trends do exist, they are at times in line with warming hypotheses and at times they are not. The complete understanding of these changes is particularly important, especially for river discharges, since availability of water is vital for human health, economic activity, ecosystem functions, and geophysical processes. In Mexico, trend analyses have mostly focused on maximum and minimum temperatures, while trend analyses of precipitation and streamflow have only partly been studied. Knowledge remains scarce, partly attributed to lack of long-term data (both in space and time), the difficulties encountered in providing a correct interpretation of changes attributed to human disturbances, as well as the complexity of the processes that externally force hydroclimate variability. Given the limited knowledge of streamflow and precipitation trend structures in Mexico, we analyzed overall trends in Mexico and described the regional structures of the trends for the period 1920-2008. Evidence of real trends over different regions of Mexico is provided, sometimes revealing that oscillations of long-term high and low humid periods (depending on their arrangement) force the fitted linear trend model. This implies that declining or increasing trends are restrained by the length of the records. However, there are also cases of unambiguous multi-decadal trends in rainfall and streamflow time series that required more detailed analysis.



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**Snow cover in Russia in changing climate: dynamics, mechanisms and impacts**

*V.A. SEMENOV, E.D. BABINA, A.V. BORZENKOVA, E.A. CHERENKOVA, L.M KITAEV, A.YU. MIKHAILOV, P.A. MOROZOVA, V.V. POPOVA, V.S. SOKRATOV, D.V. TURKOV, T.B. TITKOVA, V.V. VINOGRADOVA, A.N. ZOLOTOKRYLIN (Russian Federation)*

Changes of snow cover in Russian during the last decades are estimated using different data sources including station data, satellite observations, reanalyses, results of simulations with a land surface model utilizing reanalysis data, and global climate models. In particular, ensemble simulations with global atmospheric circulation model using prescribed low boundary conditions (observed sea surface temperature and sea ice concentrations) for the last decades are investigated. Based on these experiments, contributions of the global ocean warning and internal stochastic variability of the atmosphere to climatic trends of snow cover characteristics are estimated. Links between major atmospheric variability modes in the Northern Hemisphere and snow cover are analyzed. Impacts of changing snow conditions on transportation and agriculture are considered including analysis of winter snow cover effect on spring vegetation conditions and intense snowfall impact on traffic in large cities. A methodology of snow cover reconstruction in data sparse regions based on the land surface model is presented.



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## Satellite monitoring of the Earth's radiation balance and mapping the distribution of its components

*Maksim CHERVYAKOV, Alexander KOTUMA (Russian Federation)*

A new «Meteor» satellite program has been started in Russia. The first satellite of new generation «Meteor-M» №1 was put into orbit on September 16, 2009. The equipment IKOR – «The Measuring instrument of short-wave reflected radiation» was created in Saratov State University. It was installed on Russian hydrometeorological satellite «Meteor-M» №1. Radiometer IKOR is intended for satellite monitoring of the outgoing reflected short-wave radiation, which is one of the components of Earth radiation balance. Such information can be used in different models of long-term weather forecasts, in researches of climate change trends and also in calculation of absorbed solar radiation values (ASR) and albedo of the Earth-atmosphere system. It was assessed spatial and temporal variations of albedo and the absorbed solar radiation over different regions. Latitudinal distributions of albedo and ASR were estimated in more detail. Meridional cross sections over oceans and land were used separately for this estimation. It was shown that the albedo and ASR data received from the radiometer IKOR can be used to detect El-Nino in the Pacific Ocean and monitoring of the East Asian Summer Monsoon. It should be noted that cloudiness makes a significant contribution to the planetary albedo of the Earth, largely determines its spatial-temporal distribution. In particular, it is important to know what contribution cloudiness makes to albedo and what the relationship between them. Therefore, comparisons between albedo and cloudiness were conducted separately for land and oceans. The comparison of the distributions of cloudiness and albedo had identified the existence of significant correlation to the World Ocean, lower values for the World Ocean and land together and small correlation for land. The report will be presented more detailed results.



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**Isotopic Composition Of Precipitation Generated At Particular Atmospheric Circulation Pattern**

*Mihael BRENČIČ, Nina KONONOVA, Polona VREČA (Slovenia)*

Precipitation generating processes depend on atmospheric circulation patterns and consequently it is expected that its stable isotopic composition of hydrogen and oxygen is related to them. Precipitation generated at similar atmospheric circulation patterns should have similar empirical distribution of δ2H and δ18O values. Mathematical ECM-isotope model based on the linear combination of δ2H and δ18O values and on precipitation amount weighted average was constructed. The model enables estimation of average δ2H and δ18O values and their standard deviation for the precipitation generated at distinctive atmospheric circulation patterns. We have applied approach where atmospheric circulation patterns were classified as elementary circulation mechanisms based on the system of Dzerdzeevskii and co workers. Estimated values of the parameters for empirical distributions of δ2H and δ18O of each classification subtype have shown that the estimates are reasonable and grouping based on these estimates is reasonably similar to groupings based on the applied atmospheric circulation pattern classification.



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**Temperature Variability and Incidence of Heat Waves in Rayalaseema and Telangana S Sreekesh**

*S SREEKESH (India)*

Mean monthly temperature shows extreme spatial and temporal variability during the summer months in India. Extreme maximum temperature conditions are commonly recorded more commonly in arid and semi-arid regions of India. They mostly occur during the summer months from March to May in the South India and it is more prevalent during April to June months in North India. These extreme maximum temperature conditions may turn to heat wave conditions adversely affecting the humans and also agricultural operations. Heat wave induced deaths are common in India during summer months. With the reported change in temperature conditions in India as well as other regions of the world, the pattern and trend of occurrence of heat waves along with its intensity need to be analyzed. It is also essential to analyze whether changes in maximum temperature and its trend are contributing to such changes in heat waves or not. Present study analyzed the pattern and trend in mean monthly maximum temperature conditions and heat wave conditions for 30 years during 1981-2010 for selected places of Telangana and Rayalaseema regions in South India. The daily maximum and monthly mean maximum temperature data were collected for the summer months of April, May and June for the study sites from the daily weather reports of India Meteorological Department. The temperature pattern has been analyzed by fitting the trend line in a graph. The IMD criterion has been used to identify the heat wave conditions. The heat waves were also classified according to severity conditions as defined by IMD. It has been observed that mean monthly maximum temperature is showing high variability in different months. In certain locations it is showing an increasing trend as well. May and early June experienced more frequent heat wave than March and April. Heat wave conditions were more prevalent during the decade 1991-2000 than the previous decade. The severity and duration of heat wave conditions are more in the past 15 years or so. The occurrences of heat waves are more common during the periods of higher maximum temperature.



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**Large-Scale Climate Anomalis Over Eurasia: Astrogeographical Analysis**

*Alex RETEJUM, Kirill DIAKONOV (Russian Federation)*

Arctic Warming as a Result of Natural Process of Hydrogen Combustion A.Ju.Retejum Climate changes have tendencies of both increasing and decreasing of air temperature for last 50 years in different parts of the Northern hemisphere. The most significant positive anomalies are located in the Arctic where one can observe great interregional contrasts in pace of warming. These global phenomena need to be explained. As a main methodological tool the author used joint analysis of long-term data set for gridded (10° x 10°, January and July) surface air temperature, geophysical processes and a mental critical experiment. There are several strong evidences of energy release from the ocean's bottom. It was revealed that ice melting events associated with widening of coastal flow lead coincide as a rule with the total ozone anomaly above Arctic seas caused by a reaction of oxygen with hydrogen migrating from the Earth's core. The Arctic warming happens in time of unprecedentedly high level of volcanic activity in the world and especially in northern latitudes which pointed out on degasation speed up. Ice extent, air temperature, total ozone content, geomagnetic field intensity and other environment variables are tightly connected to the westward motion (along 78°W) of the North pole coordinate Y reflecting the planet's expansion. This conclusion got a final confirmation by results of the mental critical experiment with heating effects of the Earth core rising around the time of the March equinox in 1979-2014. The deglaciation in Arctic needs in depth study of energy exchange processes between the Earth envelops.



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**Winter anticyclonic activity in the Mediterranean-Black Sea region and its climate variability**

*Olha KOVALENKO, Elena VOSKRESENSKAYA (Russian Federation)*

The aim of paper is to study anticyclones' frequency in the Mediterranean-Black Sea (MBS) region in winter during 1951–2012 and to analyze their variability associated with global processes in the atmosphere-ocean system: North Atlantic Oscillation (NAO), El-Nino-Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO) and Atlantic Multidecadal Oscillation (AMO). The NCEP/NCAR reanalysis dataset of 1000 hPa height geopotential field for synoptic terms (00,06,12,18 GMT) (1951–2012) in winter over the MBS region was used. Anticyclones' frequency was estimated using methodology (Bardin, 1995). Results. Winter anticyclones' frequency is characterized by maximum values in the Black sea region. Its linear trends (95% level of significancy) in this period are positive in the Black sea region and in the Western Mediterranean and negative in the Eastern Mediterranean. It was found that in the positive NAO phase the anticyclones' frequency is over 43% higher in the Black sea region and 32% higher in the Western Mediterranean. Taking into account our previous results of ENSO-events classification it was shown that "spring" ENSO-type is accompanied by anticyclones' frequency intensification in the BSM region. Winter anticyclones' frequency in the Black Sea region increases over 45% during the positive PDO phase, while in the Eastern Mediterranean it decreases. It was confirmed that AMO influences the character of anticyclones activity over the MBS in winter. The positive AMO phase is characterized by the anticyclones' frequency rise in the Eastern Mediterranean.



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**Space-time distribution of China's water resources under the global climate change**

*Haibin-XIA, Zheng-WANG, Qun-LE (China)*

The water resource is the basic proposition of agricultural and industrial development in China because of our big population. It is noteworthy that what climate change will effect on Chinese future water resource. The influence of climate change includes precipitation and evaporation, of which the former is more discussed and the latter is readily ignored. This article is based on the regional climate model (RegCM4) which is developed by NCAR/PSU( National Center of Aatmospheric Research/University of Pennsylvania). We made a simulation to estimate the future climate change in China with A1B scenario. And got the spatial distribution characteristics of temperature and precipitation in historical period (1981-2000 average annual value) and future period(2041-2060 average annual value). The P-M evapotranspiration model recommended by the FAO is used to calculate the evaporation. And the moist degree is used as the index of water resources. In general, the results showed that water resources in China present latitude zonal distribution, gradually reduce form south to north. From the trend of the change, the water resources in the south of Yangtze river will decrease in the future, on the other hand, in the north of Yangtze river , especially in the north of the Huai-he river , the water resources condition will get better. The most obvious regions for the growth of water resources include the western of northeast China ,Huai-he river basin, Si-chuan province and the south of Tibetan autonomous region.



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**The North Atlantic Dipole appears to affect upon the climate of Eurasia**

*Ilya SERYKH, Vladimir BYSHEV, Victor NEIMAN, Juri ROMANOV (Russian Federation)*

In the mid-1970s a heat content of the Northern Atlantic Ocean upper layer changed significantly. Accompanying climatic signal of a high level appears to be followed for such an event. In order to test this hypothesis the global fields of hydro-physical and meteorological characteristics have been considered in consequence with negative (1950-1970) and positive (1980-1999) phases of the North Atlantic Oscillation (NAO). The analysis has revealed the existence of a temperature dipole in the upper waters of the North Atlantic, which in a sense can be interpreted as an oceanic analogue of atmospheric NAO. The index of North Atlantic Dipole (NAD) has been proposed as the 0-100 m layer average temperature difference between the regions (20°-40°N; 80°-30°W) and (50°-70°N; 60°-10°W). Afterwards there were discussed a possible physical mechanism of the internal change of the ocean-atmosphere interaction in the North Atlantic over a period of 60-70 years and its impact on the climate of Eurasia. It was revealed that a recent ocean-atmosphere system state in the area under consideration becomes qualitatively similar to that of the period 1950-1970, when the Euro-Asian region has been affected by the very high continentality index. So, there is a reason to expect for approach a more severe climate phase to the area, in particular western Russia, in the form of relatively colder and snowless winters and the hotter-drier summer seasons.



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**The Changes Of Precipitation Trends And Their Effects On The Environment In The Western Anatolia (Turkey)**

*Hasan CUKUR (Turkey)*

The study area covers the western part of Anatolia which is under typical Mediterranean Climatic conditions. These conditions characterized as mild and rainy winters, hot and dry summers prevail in the research area. In this study, it is used daily precipitation data of meteorological stations in the western Anatolia. These data include that are last thirty years. In this research, it will be determined variations, quantities and frequencies of daily precipitation by means of Mann-Kendall method. In the Western Anatolia, annual average precipitation is about 700 mm in a year. Generally the amount of precipitation mostly depends on geographical conditions, topographic properties (altitude, aspect, direction of mountain ranges) and continentality conditions are responsible for the distribution of precipitation and planetary factors. But in the last years, quantity and characterize of rain has become changed. The amount of rainfall is affected by frontal activities, properties of air mass and/or NAO (North Atlantic Oscillations). There are great seasonal differences in amount of precipitation according to geographical region of Turkey. In the every meteorological station, the rainy day numbers and amount of annual precipitations change in a great extent year by year. The differences between the amount of the minimum and maximum precipitation attains three fold. For example, annual minimum and maximum precipitation changes between 361-1050 mm at Izmir. The trend of seasonal, annual precipitation and changing of rainy day numbers are remarkable in the Western Anatolia. In the recent years, rainless day numbers have getting increased. Other important situation, there is a decrease trend in the normal rainfall categories when the heavy rainfall categories have increased in the Mediterranean climatic conditions. Therefore, daily rainfall amounts are in increasing trends. The increases of heavy rainfall have led to torrential floods causing heavy causalities in the area. On the other hand when dry period continued for several years, these conditions play an important role in the environment assessments and human activities. In this study, it will be determined properties of precipitation and its effects on the environment. Key words: daily precipitation, precipitation trend, Western Anatolia.



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## Heat and Cold Waves Dynamics in European Part of Russia

*Vladyslav EVSTIGNEEV, V. NAUMOVA, N. LEMESHKO, A. LUBKOV (Russian Federation)*

Evolution of the global processes makes the climate system to be steering towards different states, producing regional climate impacts. Prospection of that states enables one to speculate on climate change perspectives for specific region as well as hydro-meteorological events within its margins. Heat and cold waves are weather extremes which are forced by synoptic-scale processes and can be amplified by positive regional feedbacks (e.g., soil-atmosphere feedback for heat waves), while tendencies of its descriptive values are the result of the global processes in the climate system. Air temperature data records are a basis for heat/cold wave dynamics studies whereas each time series is a blend of various modes with synoptic-to-multidecadal scales. Hence, method of extraction of heat and cold waves is a crucial issue to be addressed. The goal of the present study is to investigate long-term variability of characteristics of heat/cold waves on the European part of Russia using secular data of routine meteorological observations. A new objective method to extract heat/cold wave events using recently developed concept of modulated annual cycle (MAC) was verified. Statistical description of initial period of the wave formation, intensity and duration and its extremes was accomplished for the region under investigation. A new treatment of heat/cold wave events gave thorough description of the driving atmosphere processes. Interannual and interdecadal modes of variability have been detected encompassing the main time scales of global climate variability in the Northern Hemisphere.



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**Climate and Agricultural Policies on Russian Grain Yields, 1958–2010**

*N.M. DRONIN, A.P. KIRILENKO (Russian Federation)*

Agriculture in Russia has always had to contend with unfavorable climate. At the same time, large-scale socio-economic experiments have also strained the country's food production potential throughout the 20th century. The relative role of climate and state agricultural policies in affecting production of cereals was studied for the period of 1958–2010. The study attempted to explain the difference between the actual (officially reported) yield and a sum of climatic (explained by the weather) yield and multiyear trend as a result of the agrotechnical progress. The variations of harvest adjusted for weather component and management improvements were considered in connection with the following agricultural policies during the key periods of Russian agriculture history: "Virgin Lands" campaign (end of 1950s), Kosygin-Liberman initiatives (late 1960s), Brezhnev's investment programmes in response of stagnation of agriculture (late 1970s – early 1980s), Gorbachev's "Perestrojka" (1985–1991), and land privatization and price liberalization (1990s).



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**Atmosphere circulation anomalies over Amur basin during extreme high-water and low-water summer seasons**

*Ekaterina TATARINOVICH (Russian Federation)*

Hydrological anomalies which occurred in the last decade in the Amur river basin, russian Far Eastern region that has rich natural resources, require detail research of their reasons. Total water runoff of the Amur river during warm periods depends on quantity of a precipitation. The formation of heavy precipitation and low-water summer seasons are connected with macrometeorological conditions. In the context of revealed regional climate changes over the Amur basin the atmosphere circulation conditions of extreme drought in 2008 and catastrophic flood in 2013 are analysed. The choice of these two different for weather conditions events lead to discover common connections of the meteorological processes over the Amur basin with the climate anomalies. It is revealed that the formation of heavy precipitation in the Amur river basin in june — september 2013 is associated with the series of polar-front cyclones of the unprecedented duration and intensity. The intensification of frontal rainfalls was caused by the active participation in frontal processes of very warm and moist marine tropical air from the Pacific Ocean. The simultaneous deepening of the surface Far Eastern depression and the strengthening of the subtropical high over the ocean became a reason for the dramatic intensification of the moisture-laden monsoon flow. The drought in 2008 is associated with strengthening of the high pressure area over the Amur basin, that didn't allow main source of heavy rainfall take part in the frontal processes. Correlation analysis of vertical velocity with Arctic oscillation (AO) and Pacific-North American (PNA) teleconnection patterns revealed their significant dependence.



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**The Climate and its Impacts on Egyptian Civilized Heritage: El-Nadura Temple in El- Kharga Oasis, Western Desert of Egypt as a Case Study**

*Hossam ISMAEL, Mona EL-KIALY (Egypt)*

Undoubtedly, El-Kharga Oasis monumental sites are considered an important part of our world´s cultural heritage in the South Western Desert of Egypt. These sites are scattered on the floor of the oasis representing ancient civilizations. The Roman stone monuments in Kharga represent cultural heritage of an outstanding universal value. Such those monuments have suffered weathering deterioration. There are various elements which affect the weathering process of stone monuments: climate conditions, shapes of cultural heritages, exposed time periods, terrains, and vegetation around them, etc. Among these, climate conditions are the most significant factor affecting the deterioration of Archeological sites in Egypt. El-Kharga Oasis belongs administratively to the New Valley Governorate. It is located in the southern part of the western desert of Egypt, lies between latitudes 22º30'14" and 26º00'00" N, and between 30º27'00" and 30º47'00" E. The area of El Kharga Oasis covers about 7500 square kilometers. Pilot studies were carried out on the El-Nadura Temple, composed of sandstones originating from the great sand sea. The major objective of this study is to monitor and measure the weathering features and the weathering rate affecting the building stones forming El-Nadora Roman building rocks in cubic cm. To achieve these aims, the present study used analysis of climatic data such as annual and seasonal solar radiation, Monthly average number of hours of sunshine, maximum and minimum air temperatures, wind speed, which have obtained from actual field measurements and data Meteorological Authority of El-Kharga station for the period 1941 to 2000 (60 years), and from the period 1941-2050 (110 years) as a long term of temperature data. Several samples were collected and examined by polarizing microscopy (PLM), X-ray diffraction analysis (XRD) and scanning electron microscopy equipped with an energy dispersive X-ray analysis system (SEM-EDX). The results were in agreement with the observed values in the study area. The deterioration of El-Nadora temple is above 45 % of original temple (138-161 BC), these deteriorations have occurred not only due to the age of the structures, but also due to the climate elements. It was found that the climate is the most important elements influencing weathering. El-Nadora temple is highly influenced by wind action because it was built on a hill top 180 meter in hyper arid climate and exposed to wind without any obstruction. Finally, El-Nadora Temple has lost about 42.46 % of its original size. And if the rate of deterioration continues, the major landmarks, symbols and inscriptions will fully disappear in 2150. Keywords: Roman monuments; El-Nadora Temple; Weathering forms; deterioration.



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# Impact of the Carbon Abatement of Manufacturing Process Control on Household Welfare and Regional Economic Development

*Yi SUN, Zhangqi ZHONG, Chenjin XU, Zheng WANG (China)*

The changes of household welfare in terms of income and consumption has an important and far-reaching impact on the general public's attitudes towards CO2 emissions reduction policy, which will fundamentally determine whether the policy can be implemented within the context of global climate change. Given the situation, based on the method of social accounting matrix (SAM)equilibrium, this paper presents a self-developed inter-province multi-regional dynamic computable general equilibrium(CGE) model, then analyzes and simulates the impacts of different carbon abatement policies on household welfare in terms of income and consumption and regional economic development in China. The results show that remarkable differences in regional GDP growth rate affected by emissions mitigation policies exist in China, and regional economic convergence would be obviously damaged under natural growth scenario. More seriously, however, the gap between China's regional economies is being widened again. In addition, although household income is less affected by the carbon abatement policy of manufacturing process control at the early stage of the simulation, the long-term impact of the policy should not be ignored. Thus, active initiatives are being taken to increase income of the residents, which should be paid more attention to. Furthermore, because the Chinese government has provided some targeted policies such as the Old-Age security policy and the Three-Agriculture policy (namely, agriculture, rural areas and farmers) to increase income of the retired urban residents and rural residents respectively, their welfare in terms of income have suffered less from the impact of CO2 emissions reduction policy. While income growth for urban labor is lack of the related support policy from the government, so next the key thing we are focused on is priority must be given to provide more income for them. Meanwhile according to the simulation results, considering the adverse impact of CO2 emissions reduction policy on absolute number of income growth for the household, though the policy is more conducive to reduce the gap between the rural and urban residents' income and between generations, the extent of the reduction is too early to be overly optimistic.



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**Perception of climate change among the Evenk in Southern Yakutia: The Case of Khatysyr, Aldan District, Republic of Sakha (Yakutia)**

*Antonina SAVVINOVA, Victoriia FILIPPOVA, Alena SVINOBOEVA (Russian Federation); Trevor FULLER (USA)*

Purpose: Assessing perceptions of climate change in southern Yakutia among the Evenk who practicing subsistence lifestyles hunters and reindeer herders* . Study Area: The Belletsky Evenk National nasleg is situated in the Aldan district, which is located in the southern part of Yakutia. The main economic activities in nasleg are hunting and reindeer herding. Methodology: Open-ended interviews were conducted in September 2014 with residents of the study area, with a particular focus on hunters and reindeer herders. Questions revolved around perceptions of and interactions with industrial development in the study area, as well as observations of residents regarding climate change in the region. Conclusions: This research provided information regarding the impact of climate change on reindeer herding and hunting in southern Yakutia. Research revealed perceptions of a link between notable changes in the 'local' climate and a decreased number of deer in the area, greater difficulty securing food, protecting reindeer herds from predatory wolf populations, and increased flooding of the Aldan River along with a reduction in fisheries productivity. * supported by grant of Russian Foundation for the Humanities project 14-11-14002.



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**Improving Precipitation Forecasting Models In Southwestern Of Iran**

*Mohammad Jafar NAZEMOSADAT (Iran)*

A number of investigators reported above normal precipitation and more frequent rainy days for southwest of Iran during phases 1 of the Madden–Julian oscillation (MJO). The aim of the present study was to improve the MJO-based rainfall prediction over this area during this phase. All of the MJO amplitudes during phase 1 were extracted for the period 1975-2012. The days with amplitudes greater than 1 were assigned as the strong MJO events and used for this study. Frequencies of the days with or without precipitation were then investigated for such events. Also, precipitation intensity and the characteristics of some oceanic-atmospheric variables were examined during adopted strong events. Daily precipitation data of nine stations spread in various parts of southwest Iran were analyzed. The detected MJO strong spells were then composited with the rainfall data. Results indicate that, for improving precipitation forecast in southwest of Iran, not only the amplitude size, but also the position and intensity of convective activities over the Indian and the Pacific Oceans equators should be carefully monitored. In phase 1, rainy periods in southwest of Iran consistently occurred when equatorial convective activities centered over the areas between 50o E to 60oE and 5o S to 5o N. For such circumstances, anomalies of the outgoing long-wave radiation (OLR) over this domain dropped to (-20 Watt/m2) or lower. However, non-rainy events of the strong events were coincided with the episodes that OLR anomalies over this domain are consistently greater than this value.



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**Formation of Heavy Precipitation in southwestern Part of Iran and its Association with the Madden-Julian Oscillation**

*Mohammad Jafar NAZEMOSADAT K. SHAHGHOLIAN; Ghaedamini, H, Mehravar. S (Iran)*

The present study was mainly aimed to assess some synoptic characteristics of heavy precipitation in southwestern parts of Iran and evaluates the relationship between these attributes with the Madden-Julian Oscillation (MJO). Daily records of the November-April precipitation data in ten stations were collected for the 1975- 2011 period. precipitation values that were fallen within the 5% of highest records were categorized as the heavy precipitation for each station. It was found that heavy precipitation mostly occurs during phase 8, 7, 2 and 1 of the MJO (with about 21%, 18%, 17% and 13% of the total frequency). It was found that formation of a cyclonic circulation that encompasses the Mediterranean Sea, Red Sea and Persian Gulf plays an influential role for moisture supplement of these storm activities. Most parts of western and southern parts of Iran benefit from eastward movement of this cyclonic activity. The maps of the specific humidity, omega and near-surface wind indicated that western parts of the Indian Ocean are the main moisture sources of the considered heavy precipitation.



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**Atmospheric circulation and storm events in the Black Sea, Caspian and Baltic Sea**

*Galina SURKOVA (Russian Federation)*

The storm events in three inner seas are examined in connection with the main atmosphere 'stormogenic' patterns grouped into the circulation types (CTs) individually for each sea, and their changes in present climate as well as future climate projections. A calendar of storms for the modern climate is derived from results of wave model SWAN (Simulating WAves Nearshore) experiments for 1948-2011. On the base of this calendar, a catalogue of atmospheric sea level pressure (SLP) fields was prepared for CTs from NCEP/NCAR dataset. Then SLP fields were subjected to a pattern recognition algorithm employing empirical orthogonal decomposition followed by cluster analysis. For every CT detailed analysis of their seasonal and interannual changes, their role in storm events formation is analyzed. An increase of the storm CTs' frequency in the second part of 20th century is shown to be in a good agreement with such teleconnection circulation patterns as Arctic Oscillation, North Atlantic Oscillation, Scandinavian blocking. Noticeable increase of storm CTs' frequency in case of RCP8.5 scenario of CMIP5 is shown on the base of CMIP5 models ensemble.



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**Long-term analysis of summer heat waves in the extreme climatic region of the Russian Far East**

*Elena GRIGORIEVA (Russian Federation), Birobidzhan ICARP FEB RAS; Chris R. DE FREITAS (New Zealand); Alexey S. GRIGORIEV (Germany)*

This work examines heat waves in cities in the vast high latitude region of the Russian Far East (RFE). According to climate global models, high latitude regions are most sensitive to human-caused climate change. A heat wave is defined as more than three days when mean daily temperature exceeds the 95 percentile for the summer months. Mean temperature for each day is based on eight three-hourly observation. A pilot study showed that summer heat wave mortality in Khabarovsk, a RFE regional capital city, can be as much as 30% higher than the average. The current research analyses heat waves statistics by decade for the months from June to August for the period 1959 to 2012 for 43 climate stations in the RFE. The aim is to determine the frequency of heat waves and their spatial and temporal distribution, duration and intensity. The intensity of heat waves was analyzed by use of the cumulative mean temperature excess. The results show that the number of heat waves was highest for almost all stations in the decade 1980-1989, when most heat waves occurred at continental stations, in contrast to other decades. The fewest heat waves occurred 1960-1969. In all cases, the longest heat waves were the most intense. For most stations, the longest heat waves occurred in July-August 2011 and covered the vast area; 25-day duration in Nelkan at the north was the strongest, with a cumulative temperature excess of 62  C. The next step is to examine annuals trends over the study period.



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# Modern tendencies of global climate change and their regional characteristics (Evidence from the West Siberian Plain)

*Nina EVSEEVA, Larisa FILANDYSHEVA, Ekaterina SAPYAN, Tatiana ZHILINA, Zoia KVASNIKOVA (Russian Federation)*

The problem of global climate change, which influences the development of natural and anthropogenic geosystems, is one of the most significant fundamental scientific and environmental problems of the current century. In our works the issue of the manifestations of global climate change in the West Siberian Plain (WSP) is regarded from a perspective not only of inter-annual, but also intra-annual (seasonal, daily) dynamics of temperature conditions and moisture regime. This approach has enabled to specificate the temporal aspect of current climate changes at the regional level. The issue of periodicity of hydrothermal regime, the steppe lakes level fluctuations and development of other natural processes in erosion, aeolian and other landscapes is also addressed in our works. Studies have shown that the current warming and moistening of climate are observed within the considered natural areas of WSP. This process develops most rapidly at the temperate latitudes, where the rise in average daily temperatures is observed during most of the year. It is more complicated at the high latitudes. In recent decades, for example, changes in air temperature in the forest tundra over the major structural units of annual cycle were small. However, the periods of time with temperature rise comparable to climate warming in Russia and Western Siberia are allocated on the curve of long-term annual variation of the average daily temperature. According to analysis, there is an increase in the amount of annual precipitation both in the North and in the South of WSP in recent decades, whereas the amount of increase of annual precipitation was almost 3 times greater in the forest-steppe zone than in the forest tundra. The regional climate changes occurring on the territory of WSP affect the stability and variability of geosystems. They need to be taken into consideration while organizing environmental management and developing adaptation efforts in economic and social life of the population.



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**Heat waves in the European Russia at the beginning of the 21st century**

*Vera VINOGRADOVA (Russian Federation)*

In the last decade the frequency of abnormally hot summer weather in the European part of Russia increased. Growth of summer temperatures is associated with increased frequency of heat waves caused by the advection of hot dry tropical air masses or transformation of temperate air masses due to their long-term stationing in the area. Such situations are caused by the blockage of western disturbance in the European part of Russia. Heat waves cause hazards such as droughts, fires, loss of crops, increased morbidity and mortality. This presentation provides an estimate of the change of the thermal loads on the population using different characteristics of heat waves and temperature gradients. The main trends in the thermal loads on the population in European Russia in the last decade due to changes in the localization of the polar front in summer are shown. It was found that the number of heat waves in European Russia had been increasing from the beginning to the end of the first decade of XXI century (especially in the south and in the centre). Average number of days with temperature above 32 °C grew up throughout the territory except the very north. The sharp increase of number, duration and intensity of the heat waves in the second half of the decade was caused by the positive temperature anomaly in the summer 2010. It is connected with the particular features of circulation. In the second half of the decade orientation of the maximum horizontal temperature gradients is close to meridional dew to the blockage of western disturbance and the prevalence of meridional processes in the European part of Russia.



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**Variability air-sea turbulent heat fluxes in CMIP5 model simulations and observational datasets**

*Ilya SERYKH, Sergey GULEV (Russian Federation)*

Surface turbulent heat fluxes are critically important in climate model experiments, since they represent a language of communication of the ocean and atmosphere. Interannual variability of surface turbulent heat fluxes is believed to be the major contributor to the changes in the ocean surface heat balance, at least in mid latitudes. Being relatively well assessed and validated in reanalyses, surface turbulent heat fluxes always were of a lesser attention in diagnostics of climate model experiments. We analyzed interannual variability of sensible and latent heat fluxes in historical climate simulations with several CMIP5 models. Variability in surface turbulent sensible and latent heat fluxes in model simulations has been analyzed during several last decades (from 1950s to 2005) with the emphasis on different scales of variability (short-term, interannual and decadal). At all scales has been found a little consistency between the changes in turbulent surface fluxes diagnosed by reanalyses and blended data sets (OA-FLUX) on one hand and model simulations on the other. Furthermore, some models (e.g. ECHAM, IPSL) surprisingly demonstrate large regions with negative correlations between sensible and latent heat fluxes, which is not the case in observational data sets (reanalyses and OAFLUX). Interestingly, variability in air temperature and surface humidity (which could be potentially considered as the reason for autocorrelation between sensible and latent fluxes) demonstrates consistency with each other at most scales. Further we discuss potential reasons for the discovered phenomenon.



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# Changes of agroclimatic conditions in the Central Nonblack Soil Zone

*Olga SUKHOVEEVA (Russian Federation)*

Climate is the global scale factor that formed ecosystems and laid the foundation of production activities. One of the results of present climate warming is the change of agroclimatic conditions, the accurate calculations of which will let to neutralize their negative consequences for agriculture. The aim is to determine regularities of change of agroclimatic conditions in the Central Nonblack Soil Zone during the century period taking into account the last 30 years. The most noteworthy climate changes were registered in the last thirty years (1981-2014) that may be proved by comparing figures obtained with climatic norm records (1881-1980). Materials of the investigation were longstanding data of 20 meteorological observatories of Central Nonblack Soil Zone. The strong and intensive upward heat supply trend, especially for the last three decades, has been marked. During 1981-2014 in comparison with XX c. there happened increase of average annual (0,3 °C/10 years) and average monthly air temperatures (in winter ≥ 0,7 °C/10 years, to 0,9 °C/10 years), increase of heat supply (growing degree-day trend 48 °C/10 years, in Western regions ≥ 55 °/10 years), continuation of warm and vegetation period, frequency and intensity of adverse events. Moistening becomes unstable (monthly trend 5 mm/10 years, annual trend > 30 mm/10 years). Continentality according to Gorchinsky index decreased by 4,3% . Climatic conditions were classified into three factors according to method of factor analysis: the first (12,6% of dispersion) – winter temperatures till the beginning of active vegetation period, the second (9,3% of dispersion) – autumn temperatures till the formation of stable snow cower, the third (8,3% of dispersion) – precipitations and temperature of the central summer months.



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**Influence of Siberian autumn snow cover anomalies on the Siberian High**

*Yuliya MARTYNOVA, Vladimir KRUPCHATNIKOV (Russian Federation)*

There are different studies of the influence of autumn snow cover anomalies on general atmospheric dynamics in the following winter (e.g. Allen R.J. and Zender C.S., 2011; Martynova Yu.V. and Krupchatnikov V.N., 2010; Popova V.V. et al., 2014). Behavior of one of the important components of general atmospheric dynamics, such as the Siberian High, is also interesting for investigation (e.g. Chernokulsky A. at al., 2013). In this study we concentrate our attention on changes of the Siberian High behavior caused by autumn snow cover anomalies. Importance of understanding of this connection is obvious. Siberia is one of the snowiest region in the world and the Siberian High largely determines winter weather in this region. Analysis was provided on the base of INMCM 4.0 and INMCM 5.0 (Volodin E.M. et al., 2010; Volodin E.M., 2014) simulation data set. One part of this set reproduces modern state of climate system and another part simulates climate system state according to the most aggressive climate scenario RCP8.5. Last of them was used for simulation of extreme snow conditions. This work is partially supported by SB RAS project VIII.80.2.1, RFBR grant 13-05-12034, 13-05-00480, 14-05-00502 and grant of the President of the Russian Federation.



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**Summer warming in North Eurasia and its consequences for environment in relation with recent global climate change**

*Valeria POPOVA, Elena CHERENKOVA, Pavel TOROPOV, Polina MOROZOVA, Alexandra SHIRYAEVA, Andrey CHAYKA (Russian Federation)*

Recent summer warming over the Russia territory and consequences for environment are studied using of monthly air temperature and precipitation and various climatic indices calculated basing on daily records of air temperature and precipitation at 526 stations in Russia from the Russian Institute of Hydrometeorological Information (RIHMI). Data on water- energy balance components obtained by Geography Department of Moscow State University during 3-years field observation in the Northern Caucuses and meteorological records and Northern Hemisphere Teleconnection Patterns time-series from NOAA were analyzed as well. Summer air temperature averaged over North Eurasia territory exhibits significant trend of 0.4°C per 10 years providing a 45% input in total variability. The latter makes it different from winter warming characterized by 11% input in total variability. Continuous growth during last decades contrasting to winter temperature may be recognized as essential peculiarity of the summer temperature. Patterns of temperature and precipitation changes over the territory of Russia for various periods demonstrate significant increase of the temperature anomaly occurrence and decrease of precipitation (for East European plain) from the beginning of 2000-s. Heat and drought events on July 2010 in East European plain and on June 2012 in West Siberia seem to be extreme manifestation of summer warming in North Eurasia and cause significant risks for environment, economy and human life. Particularly, it touches upon the hazard fires brought huge losses on July 2010 in East European plain. Nevertheless, fire danger index (Nesterov index) estimates obtained for the Baikal region show decrease of the fire risks related with meteorological conditions. Evaluations obtained for the glacier Marukh using mass-balance model exhibit the crucial impact of the increased summer air temperatures on 500-600 m glacier degradation. According to analysis of 3-year observations and measuring on the Dgankuat glacier, the major portion of water- energy balance belongs to solar radiation. For July and August 2010 its value is estimated as the anomaly high.



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# Climatic changes during the Holocene in the intracontinental areas of the Yenisei basin

*Galina YAMSKIKH (Russian Federation)*

Traditional methods of palynological investigations are using for climate and vegetation reconstructions for a long time. Nevertheless correct interpretation of palynological spectra should be done on the basis of their correlation with subfossil (recent) samples. This is considered to be the only reliable indicator of climatic and local ecological information. Vegetation and climate reconstructions in the intracontinental regions of Southern Siberia is hard because of considerable variation of factors of palynological spectra formation. Unfortunately using of linear mathematical models not always allows to get good results (Bukreeva, Yamskikh 1987; Yamskikh 1995). That is why additional investigations of various vegetation zones from Krasnoyarsk, Minusa and Todza depressions had been done in order to develop mathematical models. More than 1000 subfossil (recent) palynological samples were studied. This samples are characterized by climatic indexes (14 climatic elements). Using these data non-linear models for reconstructions of vegetation zones and various climate elements were developed. These models are considered more validative in comparison with linear ones. Program were developed by A.L. Shemel. Developed universal non-linear models of climate elements are based on empircial correlations between climate and spore-pollen spectra. Models is stable and optimal for palynological data interpretation on quantitative level and allow correct interpretation both recent and fossil spore-pollen spectra (Yamskikh, 2006,2008, 2010). In the Minusinsk depression the results obtained allowed to reveal the following regularities: 1) the mosaic of landscapes in the depression is reflected in some climate events being asynchronous compared to lowland areas; 2) during the late Holocene only regrouping in the vegetation composition occurred; 3) the warmest time intervals on the territory of Minusinsk depression are the following 4850-4100, 3650-3200, 2900-2300, and 1200-1250 years before present, 4) the phases of climate becoming more arid are most clearly evident during the middle of the cold interval of the end of the AT period and in the cold phase of the middles of SB period. The Krasnoyarsk depression is an intermountain depression located in the middle basin of the Yenisei River in the territory of the Yenisei Siberia. On its territory concentrically lie zones of Northern forest-steppe, steppe and coniferous mountain forests of the Eastern Sayan. The study of paleoclimates and paleovegetation of this territory during Late Neo Pleistocene and Holocene based on palynological study of alluvial and cave deposits of "Cave Eleneva" which located within the city of Krasnoyarsk. These types of deposits are confined with cultural horizons remains of the material culture of ancient`s people life. The best method for simultaneous reconstruction of vegetation and climate is numeral method with using palynological data ( Yamskikh, Bukreeva, 1987; Yamskikh, 1990, 2006). In order to obtain quantitative characteristics of the elements of paleoclimates and vegetation zones we used mathematical models, based on the data of modern and paleopalynological spectra (Yamskikh, 2010, 2012, 2013). In the territory



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of Krasnoyarsk depression was cold period 1200-1250 years BP and the warm time intervals of BO-1, AT -2, SB-2 and SA-3. The phases of climate becoming more arid are most clearly evident during the middle of the cold interval of the end of the warm period. The cold phase appeared of the middle of SB period which is typical and for Minusinskaya intermountain depression, located in southern Yenisey basin/. Traditional methods of palynological investigations are using for climate and vegetation reconstructions for a long time. Nevertheless correct interpretation of palynological spectra should be done on the basis of their correlation with subfossil (recent) samples. This is considered to be the only reliable indicator of climatic and local ecological information. Vegetation and climate reconstructions in the intracontinental regions of Southern Siberia is hard because of considerable variation of factors of palynological spectra formation. Unfortunately using of linear mathematical models not always allows to get good results (Bukreeva, Yamskikh 1987; Yamskikh 1995). That is why additional investigations of various vegetation zones from Krasnoyarsk, Minusa and Todza depressions had been done in order to develop mathematical models. More than 1000 subfossil (recent) palynological samples were studied. This samples are characterized by climatic indexes (14 climatic elements). Using these data non-linear models for reconstructions of vegetation zones and various climate elements were developed. These models are considered more validative in comparison with linear ones. Program were developed by A.L. Shemel. Developed universal non-linear models of climate elements are based on empircial correlations between climate and spore-pollen spectra. Models is stable and optimal for palynological data interpretation on quantitative level and allow correct interpretation both recent and fossil spore-pollen spectra (Yamskikh, 2006,2008, 2010). In the Minusinsk depression the results obtained allowed to reveal the following regularities: 1) the mosaic of landscapes in the depression is reflected in some climate events being asynchronous compared to lowland areas; 2) during the late Holocene only regrouping in the vegetation composition occurred; 3) the warmest time intervals on the territory of Minusinsk depression are the following 4850-4100, 3650-3200, 2900-2300, and 1200-1250 years before present, 4) the phases of climate becoming more arid are most clearly evident during the middle of the cold interval of the end of the AT period and in the cold phase of the middles of SB period. The Krasnoyarsk depression is an intermountain depression located in the middle basin of the Yenisei River in the territory of the Yenisei Siberia. On its territory concentrically lie zones of Northern forest-steppe, steppe and coniferous mountain forests of the Eastern Sayan. The study of paleoclimates and paleovegetation of this territory during Late Neo Pleistocene and Holocene based on palynological study of alluvial and cave deposits of "Cave Eleneva" which located within the city of Krasnoyarsk. These types of deposits are confined with cultural horizons remains of the material culture of ancient`s people life. The best method for simultaneous reconstruction of vegetation and climate is numeral method with using palynological data ( Yamskikh, Bukreeva, 1987; Yamskikh, 1990, 2006). In order to obtain quantitative characteristics of the elements of paleoclimates and vegetation zones we used mathematical models, based on the data of modern and paleopalynological spectra (Yamskikh, 2010, 2012, 2013). In the territory of Krasnoyarsk depression was cold period 1200-1250 years BP and the warm time intervals of BO-1, AT -2, SB-2 and SA-3. The phases of climate becoming more arid are most clearly evident during the middle of the cold interval of the end of the warm period. The cold phase appeared of the middle of SB period which is typical and for Minusinskaya intermountain depression, located in southern Yenisey basin.



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## AMIGO: An Argo-based Model for Investigation of the Global Ocean physics

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The AMIGO is a new P.P.Shirshov Institute of Oceanology numerical atlas, providing global maps of ocean variables to support the scientific community with near-real time, globally unified, user friendly, research quality dataset. The model uses Argo data to diagnose monthly one-degree global ocean temperature, salinity, and velocities best agreeing with Argo profiles and Aviso altimetry. Argo profiles variationally interpolated onto a vertical and horizontal grid are combined with the WOA09 climatology for layers below 2000 m and ECMWF winds into an ocean general circulation model (OGCM) to produce three-dimensional temperature, salinity, and velocities fields in the global ocean. The principle of the variational interpolation technique is to minimize the misfit between the interpolated fields defined on a regular grid and the irregularly distributed data, so the optimal solution passes as close to the data as possible. OGCM's data analysis is performed in two steps. At the first step the model velocity field is adjusted to the Argo-based T/S fields via forcing model equations of motion by the corresponding steady state winds and integrating them forward in time until all the fast transient processes are dumped. After that the full model is allowed to evolve freely under the stationary forcing fields at the surface. The integration is terminated after 10-30 days. This time is sufficient to remove fast trends from the solution. On the other hand the solution does not deviate too far from data. A basic description of the 2005-2014 ocean climate based on Argo data is presented. Temporal variability of the circulation, temperature, and salinity is discussed. The release of the near-real time product for the public use will be announced at the meeting.



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# The initial errors that induce a significant "spring predictability barrier" for El Niño events and their implications for target observation: results from an earth system model

*Wansuo DUAN, Junya HU (China)*

The National Center for Atmospheric Research (NCAR) Community Earth System Model (CESM) is used to study the "spring predictability barrier" (SPB) problem for El Niño events from the perspective of initial error growth. By conducting perfect model predictability experiments, we obtain two types of initial sea temperature errors, which often exhibit obvious season-dependent evolution and cause a significant SPB when predicting the onset of El Niño events bestriding spring. One type of initial errors possesses a sea surface temperature anomaly (SSTA) pattern with negative anomalies in the central-eastern equatorial Pacific, plus a basin-wide dipolar subsurface temperature anomaly pattern with negative anomalies in the upper layers of the eastern equatorial Pacific and positive anomalies in the lower layers of the western equatorial Pacific. The other type consists of an SSTA component with positive anomalies over the southeastern equatorial Pacific, plus a large-scale zonal dipole pattern of the subsurface temperature anomaly with positive anomalies in the upper layers of the eastern equatorial Pacific and negative anomalies in the lower layers of the central-western equatorial Pacific. Both exhibit a La Niña-like evolving mode and cause an under-prediction for Niño-3 SSTA of El Niño events. For the former initial error type, the resultant prediction errors grow in a manner similar to the behavior of the growth phase of La Niña; while for the latter initial error type, they experience a process that is similar to El Niño decay and transition to a La Niña growth phase. Both two types of initial errors cause negative prediction errors of Niño-3 SSTA for El Niño events. The prediction errors for Niño-3 SSTA are mainly due to the contribution of initial sea temperature errors in the large-error-related regions in the upper layers of the eastern tropical Pacific and/or in the lower layers of the western tropical Pacific. These regions may represent "sensitive areas" for El Niño – Southern Oscillation (ENSO) predictions, thereby providing information for target observations to improve the forecast skill of ENSO.



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# Determining the sensitive areas for El Niño targeted observation using an ensemble-based approach

*Fan FENG, Wansuo DUAN (China)*

Previous studies used the conditional nonlinear optimal perturbation (CNOP) approach to explore the sensitive areas for ENSO targeted observation and showed that the central-eastern equatorial Pacific was the sensitive area. However, they have not yet confirmed the validity of the sensitive areas in improving ENSO forecast skill. In this paper, we further use CMIP5 model outputs to investigate the sensitive areas for El Niño targeted observation using an ensemble-based data assimilation approach and also test the validity of these sensitive areas in improving ENSO forecast skill by this assimilation approach. The results show that the sensitive areas for targeted observation associated with tropical SST and 850hPa zonal wind are the central-eastern equatorial Pacific and the central-western equatorial Pacific respectively. And the sensitive areas of SST for El Niño targeted observation obtained from the ensemble-based approach are consistent with those gained using CNOP approach in previous studies. Furthermore, we focus on the improvement of El Niño prediction when synthetic observations in the sensitive area were assimilated under an ideal experiment configuration. The results indicate the forecast skill is much improved by assimilating synthetic SST and/or 850hPa zonal wind observations within the sensitive areas than randomly chosen areas in most EP El Niño predictions in each model. Besides, we also investigate if there exist sensitive areas of sea surface height (SSH) for El Niño targeted observation using the same approach. However, there is large diversity among the sensitive areas of SSH obtained using those models. And the forecast skill isn't much improved by assimilating SSH observations within the sensitive areas in each model, which might suggest that SSH isn't a sensitive variable in El Niño targeted observation. It is therefore reasonable to suggest that if additional observations were to be preferentially deployed in these sensitive regions of SST and/or 850hPa U wind, it might be possible to generate a better forecast for El Niño than one based on additional observations targeted elsewhere.



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**A new paleoclimatic database for Spain since the 16th century**

*Ernesto TEJEDOR, Miguel* Ángel *SAZ, Martín de LUIS, Roberto SERRANO-NOTIVOLI, Mariano BARRIENDOS, José María CUADRAT (Spain)*

In the current context of climate change in which future scenarios show increases in temperatures and a higher recurrence of extreme weather events, it is particularly important to study the evolution of the climate to be able to predict the future climate with greater accuracy. However, the instrumental climate data records just allow us to study, in the best cases, the temperature and the precipitation of the last 120 years. In this communication we present the first paleoclimatic database for the north east of Spain since the 16th century. We present a multiproxy and instrumental database composed by; climatic information extracted from historical documents such as 'rogations'; dendroclimatic information from trees of the Iberian Range and the Pyrenees; and a new instrumental database with the official records of the Spanish Meteorological Agency (AEMET). A total number of 19 historical archives have been reviewed, obtaining information regarding droughts and floods since the XV century. Furthermore, 1883 samples of Pinus uncinata, Pinus sylvestris, and Pinus nigra from 48 different locations have been analyzed, being able to develop several drought indexes. We have used the 1940-2012 period in order to calibrate the proxy data with instrumental records (12,532 precipitation stations and 5,340 temperature stations). Knowing and identifying the evolution of the past climate will allow us not only to validate the projected climate change scenarios but to adapt society to these possible major changes.



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# The climate change monitoring by the perennial fluctuations of the short-term forecast functions for various type avalanches

*Y.B. ANDREEV, D.M. FROLOV, P.B.GREBENNIKOV (Russian Federation)*

This method is based on a short-term discriminant-type forecast function representing itself principally some hydrothermic indicator. Constructing a long-term forecast function by averaging realized short-term forecast function values upon current 3-year intervals for various avalanche types and subsequent summing up received functions values we become integral fluctuation curve reflecting perennial climate changes. These ones are connected with corresponding avalanche activity fluctuation featured by basic cycles and a some trend. So we can predict an avalanche activity with sufficient probability in next years. Obviously the greater forecast function values are the more intensive avalanche processes activity and their spreading scale both in background aspect and in concrete avalanche sites. In turn those values are to be proved statistically tied with deposit range, square and volume. So our analyse displayed the probable decrease of the general avalanche activity trend with main harmonics of 8-, 16- year fluctuation cycles by temporal decreasing avalanche number and amplitudes after end of the 70-th on 1936-2004 period. Such result show most probably in favor of a gradual climate warming up and does not contradict conclusions as to climate change trend of other authors in glaciology and climatology regions using alternate methods. But our final conclusions have to be done after extending of observation series to 20-30 years more and in some other avalanche sites with various expositions. As researched regions Khibiny and Elbrus vicinity were taken.



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# Methane release on East Siberian sea shelf

*Elena PANOVA, I.V. GONCHAROV, I.P. SEMILETOV (Russian Federation)*

Shelf of the East Siberian Sea, which includes 40% of the Arctic shelf, is not only a region with unique hydrocarbon reserves, but also is one of the key components of the Arctic and the Earth Climate System. The result of global warming could be subsea permafrost thawing, the thaw-release of the contained organic carbon and methane gas hydrate destabilization, which in turn can lead to a substantial increase in its emission into the Arctic region atmosphere. It is assumed that the sub-sea permafrost, on the one hand, prevents diagenetic transformation of the contained organic matter, on the other hand, acts as a lid preventing migration of methane and other gases from the deep lying horizons. However, recent studies aimed at exploring methane dissolved in seawater indicate that over 80% of the East Siberian shelf bottom waters and over 50% of surface waters are supersaturated with methane regarding to the atmosphere. Calculations show that the transfer to the atmosphere of just a small fraction of the methane released from the sediments of the East Siberian shelf could trigger a sharp warming. But the nature of this methane's not clear yet. In order to both identify the nature of the behavior of different OC types (terrestrial and subsea permafrost, different bioproducers and modern bottom silts, hydrocarbons migrating from deep lying horizons) and to estimate the carbon balance it is necessary to conduct detailed geochemical studies.



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**Reconstruction of extreme precipitation events in Spain in last 70 years**

*Roberto SERRANO-NOTIVOLI, Santiago BEGUERÍA, Martín de LUIS, Miguel* Ángel *SAZ, Ernesto TEJEDOR, José, María CUADRAT (Spain)*

Climate change projections show that in a context of global warming, the patterns of precipitation are in constant change. Although the shifts are not in same direction as temperatures all over the world, the IPCC AR5 shows for precipitation in Mediterranean region meaningful decreases in total amounts but more frequency of extreme events. In this sense, reliable high-resolution datasets are very important to characterize the behavior of precipitation especially in vulnerable zones. We have reconstructed 73 years (1940-2012) of daily precipitation data by an innovative spatially based method with inherent climate data information: longitude, latitude and elevation. These three parameters were combined with the nearest stations data for each observatory in order to obtain a final predicted series used to remove anomalies and fill gaps in the original series. We have used 12,532 stations from different sources all over Spain and calculated 5 extreme precipitation indices to see spatial and temporal trends by mapping all of them. This communication summarizes the work developed to create high-resolution daily datasets of precipitation of Spain in the framework of the projects CGL2012-31668 about extreme events in Spain and CGL2011-28255 about historical climate in Spain. The study of extreme precipitation events is of key importance in Spain because of its importance on territory management.



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**Modern regional structure of humidification and its seasonal extremes in the East European Plain**

*Elena CHERENKOVA (Russian Federation)*

This study is dedicated to evaluation of the variability of humidification in the East European Plain. Eleven regions with quasi-homogeneous inter-annual changes in the Humidity Index were detected for further investigation using the meteorological datasets in the period of 1936-2012. The slow increase of the humidification of subboreal landscapes was observed since the 30s - 40s of 20th century. The decrease of climate aridity in the steppe, forest-steppe and semi desert slowed down only in the 1990s, first in the western part of subboreal landscapes and then after several years, to the east direction. The increased summer aridity in the south of the East European Plain during the last decade of the 20th century - the beginning of the 21st century was caused by the rise of long continuous periods of abnormally high temperatures without effective rainfall. Therefore, the study confirmed the hypothesis on the change of the humidification tendency of the subboreal landscapes in the beginning of the 21st century. Similar changes in the humidification were revealed in south and east of the boreal landscapes. At the same time, the increase in the humidification continues in the north and west of the boreal landscapes. Only 20% of the annual humidification variation in the East European Plain is described by the large-scale circulation, 10.5% of which is associated with the Atlantic-Eurasian teleconnection patterns (North Atlantic Oscillation, East Atlantic, East Atlantic-Western Russia, Scandinavia). The variability of the teleconnection patterns over the North Pacific (Pacific-North America, West Pacific) explains 6.5% of humidification variance. 3% of annual humidification variance is related with fluctuations in the strength of the circumpolar circulation.



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## Seasonal fluctuations of air temperature on the Crimean Peninsula in connection with the atmospheric circulation in the European sector of the Northern Hemisphere

*Roman GORBUNOV, Tatiana GORBUNOVA, Nina KONONOVA (Russian Federation)*

To analyze the atmospheric processes of the European sector we used typification of the atmospheric circulation in the Northern Hemisphere, developed by B.L. Dzerdzeevskiy. The Northern Hemisphere was divided into six sectors. For European sector 4 circulation groups were allocated. For each of them we calculated total seasonal and annual duration and its deviation from the mean for the period 1899-2012 years. To compare the changes in the character of atmospheric circulation and air temperature in the Crimea we used averages monthly data of Simferopol, Feodosia, Kerch, Sevastopol and Yalta meteorological stations. The research has shown that long-term fluctuations of the atmospheric circulation in the Northern Hemisphere are manifested in variations with the time duration of the annual and seasonal circulation groups in the European sector. The correlation change in circulation structure of the season is reflected on the temperature regime of the territory. The temperature varies irregularly according to the season. This results in the change of annual amplitude temperature accordingly. The highest annual temperature amplitude from 1940 was observed in 1954, prevailing the whole year, as well as in winter and summer seasons of longitude northern circulation. After the reduction of the annual amplitude of temperature in the 90s, due to the growth of the southern cyclones' length and certain decrease in the duration of anticyclonic circulation groups another period of growth began in the XXI century. This growth is consistent with an increase in the length of northern group of longitude in conjunction with southern group. The reported study was partially supported by RFBR and Republic of Crimea, research project № 14-45-01616 р_юг_а



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**Cartographic assessment of spatial and temporal trends in the modern solar climate of the Earth**

*V.M.FEDOROV, E.A.BOZHILINA, O.V.TUTUBALINA, A.K. ILYASOV, V.TUVALEVA (Russian Federation)*

Solar climate is a theoretically calculated amount and distribution of incoming solar radiation at the top of the atmosphere or on the surface of the Earth without atmosphere. On the basis of astronomical ephemeris data we have calculated solar radiation incoming onto the Earth ellipsoid (without atmosphere) during the period from 3000 BC through to 2999 AD. We did not account for variations caused by changes in solar activity. Cartographic analysis has shown that solar radiation coming to the earth ellipsoid for the tropical year, in areas below 45 degrees of latitude in each hemisphere tends to increase, and above 45 degrees it tends to decrease. The reduction of radiation coming in the polar regions over the entire period is 2.8% relative to the average values (for the entire interval) of the incoming radiation for latitudinal zones of 85 - 90 degrees. The increase in the equatorial region is much less; reaching only 0.25% near the equator. We have analyzed the solar radiation coming to the earth ellipsoid in winter and summer half-years. We have identified a marked increase in incoming solar radiation in winter periods for each hemisphere (maximum for the whole period is 2.8%) . In the summer periods we note a decrease in incoming solar radiation (also up to 2.8%). Thus, using cartographic analysis we have defined the main features of spatial-temporal changes in modern solar climate of the Earth: latitudinal contrasts increase, seasonal differences are smoothed out. The reasons for this are associated with centennial changes in the inclination of the Earth's axis which is reduced in the modern era. The noted features may be reflected in the change of the temperature characteristics of the current global climate of the Earth.



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## Impacts Drought in the Mexican Altiplano

*José Pablo VEGA-CAMARENA, Luis BRITO-CASTILLO, Sara DIAZ-CASTRO, Juan Manuel RODRIGUEZ-ESTEVEZ, José Antonio SALINAS-PRIETO, Maria de Lourdes ROMO-AGUILAR (Mexico)*

Impacts of Drought in the Mexican Altiplano In this study, we characterized the duration, intensity, and magnitude of the drought events in the region of the Mexican Altiplano using The Standardized Precipitation Index (SPI). The index was applied to a representative of the region series. The representative series was obtained through the application of the method of empirical orthogonal functions with axes subjected to Varimax rotation. All analyses were made for the period 1970-2012. The SPI was applied on time scales of 3, 6, and 12 months; the SPI results show between 5 and 9 drought events in the timeframe considered, using reference values of SPI ≤-1. Drought events identified for 2011 were the most intense, with SPI values < - 3.00, while the longest was the period 1996-98, with a drought period of 38 months. In particular, the drought of 2011 was an event that was not restricted to the Highlands, but throughout Northern Mexico and the South of the United States, and was classified as exceptional. Its consequences are felt in the agricultural, economic, and social fields of the two Nations. We discuss possible atmospheric flow patterns associated with drought events in the region of study. The results of this work can be very useful to decision makers to monitor drought and propose tools to create an early warning system.



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## Decadal Variability of Global Precipitation: Annual Cycle

*Guoqing ZHAI, Xiaofan LI (China)*

In this study, decadal variability of annual cycle of global precipitation is examined using the CMAP [Climate Prediction Center (CPC) Merged Analysis of Precipitation], GPCP (Global Precipitation Climatology Project), and National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) reanalysis data. Annual cycle of precipitation is defined by the difference between maximum and minimum monthly mean precipitation rate (the amplitude of annual cycle of precipitation rate). The analysis of amplitude of annual cycle of precipitation rates averaged from 1979 to 2008 shows that among the three data, the reanalysis data have the strongest amplitudes covering the largest areas whereas GPCP data show the weakest amplitudes covering the smallest areas. The standard deviations of the amplitude are larger in the reanalysis data than in GPCP and CMAP data. The analysis of annual-cycle amplitude of globally averaged precipitation rate shows decreasing trends for CMAP and reanalysis data and a flat trend for GPCP data. The decreasing trend is related to the negative linear trend along equatorial Indian and Pacific Oceans in CMAP data and equatorial belt in the reanalysis data. The flat trend corresponds to the negative linear trends along equatorial Indian and Pacific Oceans offset by the positive linear trends occur over subtropical oceanic areas. The decreasing trends are associated with the increasing trends of minimum mean precipitation rates in both CMAP and reanalysis data. The flat trends occur in GPCP because both maximum and minimum mean precipitation rates show flat trends.



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# Coastal erosion and dynamical processes in the nearshore zone

## Coastal erosion and dynamical processes in the nearshore zone 1

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- The changing dynamics of the marine margin of the Kuban river delta under the influence of natural and anthropogenic factors

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- Numerical study of coastal processes in Gelendjik Bay, effect of the proposed port

  *Igor KANTARZHI, Mark ZHELEZNYAK, Sergei KIVVA, Pavlo KOLOMIETS, Raisa DEMCHENKO, Maxim SOROKIN (Russian Federation)*

- Some Basic Physical Mechanisms Of Sediment Transport In The Nearshore Zone

  *Ruben KOSYAN (Russian Federation)*



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  *Alexey SADOVSKI, Gary JEFFRESS, Philippe TISSOT, Scott DUFF (USA)*

- Coastal zone dynamic of Kaliningrad Peninsula northern shore

  *Nikolay LUGOVOY (Russian Federation)*



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**The impact of the Sea Level rise on the air passenger and freight transport for the European Union**

*Leonid SOROKIN (Russian Federation)*

The adaptation of airport infrastructure for the Sea Level rise is very important due to the position of the main airport hubs close to the costal line. On the base of Eurostat information the analysis of the impact of the Sea Level rise on the airport passengers and freight transportation was done. The air transport in the both of passengers and of freight and mail can be affected significantly by flooding the airport infrastructure.



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**Sediment Characteristics of the Beach and Subtidal Zone in Shindu Marine Protect Area**

*Young Ho SHIN, Jong Cheol SEO (Republic of Korea)*

We analyzed physical and chemical properties of sediments from 20 subtidal points and 9 beach points to define sedimentary environment between summer and winter of Shindu Marine Protected Area. Means of particle size in summer were generally finer than winter's. There was distinctively spatial pattern that particle sizes became increasingly fine as west direction and apart from beach in summer, but this pattern was not shown in winter. Coarse sediments were prevailed in winter. To explain these patterns, we propose possible two causes which are spatially different water depth condition related with seasonal wave climate or fine sediment input from an estuary located in south of this area during summer rainy season. Contents of exchangeable cations of sediment in summer were shown Na+>Ca2+>Mg2+>K+ in order, but those of winter were shown Na+>Mg2+ Ca2+>K+. Contents of Na+, Mg2+, and K+ were related with contents of fine sediment and showed high correlation in each other. These relations were not shown between Ca2+and others. Our results show that there are spatio-temporal unique sedimentary environments between subtidal zone, beach, and dune near Shindu Marine Protected Area. Therefore, we should consider these spatio-temporal patterns for environmentally sound management of Shindu coastal system.



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## Wave transformation due underwater bars

*Dmitry KORZININ, Sergey KUZNETSOV, Yana SAPRYKINA, Andrey KOVALENKO (Russian Federation)*

For coastal protection more actual is research of result of wave transformation due underwater bars, specifically nonlinear wave decomposition and formation of secondary waves. Change of water depth during the wave propagation over submerged bar activates nonlinear-dispersive mechanism of formation of secondary waves. A growth of the higher nonlinear harmonics leads to arising of additional peaks on the initial wave surface and to increasing of the mean frequency of waves or to decreasing of the mean period of waves that may be very useful for innovation methods of shore protection. In addition, decreasing wave height is result of dissipative mechanism of wave transformation due underwater bar. Optimal relations between parameters of bars and waves for decreasing wave period and wave height were defined. Permeable bar more effective for longer waves in contrast to solid bar. For permeable bar optimal relation for decreasing wave period between length of bar and effective wavelength (Lbar/L) equals 0.08. For solid bar relation Lbar/L equals 0.32 for effective decreasing wave period. The modeling revealed that combination of parameters of bar and waves for decreasing wave period differ from similar combination for decreasing wave height. For decreasing wave height the optimal length of solid bar must be 0.55 of initial wavelength and 0.21 for permeable bar.



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# Changes In The Climatological Cycles Of The Southern Brazilian Coast And Its Consequences For Management Of Coastal Environments Subject To Erosion

*Miguel da GUIA ALBUQUERQUE, Iran CORRÊA, Lauro CALLIARI, Jean ESPINOZA, Deivid LEAL ALVES (Brazil)*

The thematic climate change, and the adaptation of the coastal cities to its effects has been substantially debated over the past few years. The United Framework Convention on Climate Change (UNFCCC) considers climate changes only the changes directly or indirectly resulting from human action. To the southern Brazilian littoral, focus of this study, the occurrence of natural disasters have been linked with the extreme events actions so that the extension of the extension of these events is still inconclusive. From historical series of aerial photographs, satellite images and shoreline position data collected in situ this study aims describe the evolution of the erosive processes in the southern littoral of Brazil between the years 1947 to 2013, to characterize the effect of the changes in climate cycles in the intensification of erosion in coastal areas. Along 66 years, the beaches of southern Brazil have experienced erosion due to the establishment of buildings in the dune field. Since 1975, the erosion process was stabilized due to the first track of the dune field is fully built. In the next years, changes in the patterns of cyclogenesis, which are responsible for the formation of cyclones and anticlyclones, provide an intensification of extreme events incidents on the southern Brazil coast. Baroclinic instabilities associated with positive thermal anomalies in South Atlantic Ocean were responsible for the greatest episodes erosive, resulting in the destruction of homes by the sea. Thus, the actions of coastal managers should be directed to the mapping of the frequency and mode of occurrence of such event, and the implementation of mitigation and preventive measures that can minimize the impacts caused by these phenomena.



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# The changing dynamics of the marine margin of the Kuban river delta under the influence of natural and anthropogenic factors

*Dmitry MAGRITSKY, A. IVANOV (Russian Federation)*

In the second half of the XX century and in the beginning of XXI century the main factors affecting the dynamics of the marine margin of the Kuban river Delta has changed significantly. First, sediment runoff of the river has decreased from 9.25 to 1.64 million tons/year. This is a consequence of the creation of the Krasnodar reservoir and anthropogenic reduction of the water runoff of the river. In the period 2001-2010 irreversible water intake in the basin of the Kuban river was equal ~5,2 km3/year. Secondly, the main transit of river sediments to the coastal zone of the Azov sea is now concentrated in only two mouths of the delta branches, while the length of the marine margin of the delta is 139 km The role of marine channels in the distribution of sediments reduced many times. Thirdly, the level of the Azov sea is constantly rising. Intensity of rising sea level on the gauges Temryuk-port, Primorsko-Akhtarsk, Taganrog and Yeysk reaches 4,2 mm/yr (1916-2006), 2,4 mm/yr (1916-2005), 1 mm/yr (1882-1998) and 1,9 mm/yr (1915-1998). Fourth, the volume of production of sea shellfish are reduced. One reason is the deterioration of the quality of river and sea waters. These factors have led in the second half of the XX century to change of the dynamics of the marine margin of the Kuban river Delta and the strengthening the processes of seashore abrasion. Currently, the total length of the zone of seashore abrasion is 61,6% (from total length of delta sea margin), moving forward shores is equal 34%, stable shores is equal 4,4%. The value of coastal retreat reaches 1-4 m/yr. In the future moving forward delta in the sea, even near at the mouths of the main branches of Kuban river delta, stops entirely.



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# Water temperature variability in the gradient-vorticity wave field in the Japan/East Sea Tsushima/ Ulleung Basin

*Anastasia ZVEREVA, Victor FOUX (Russian Federation)*

In article (Zvereva A.E., Foux V.R., 2014) new way of treatment of the defined sea level perturbations in the Japan/East Sea Tsushima/ Ulleung Basin based on satellite altimetry data in terms of wave theory was offered. The relation between thermocline water temperature and surface layer wave dynamics, explained by first modes of Complex Singular Value Decomposition (CSVD) of the sea level anomalies (SLA), is still questionable. This brings us back to one of the main problems of the modern oceanography –waves or eddies? SLA maps (aviso.altimetry.fr/duacs/) for selected intervals between August 1999 – June 2001, during which Mitchell and coauthors found 5 quasi-stable patterns in temperature field at 100-dbar, were created (Mitchell et al., 2005). Resemblance of temperature contours and initial sea level anomalies distribution was revealed, however, only after steric seasonal signal filtration the relation between some of temperature features and CSVD reconstructed sea level, considered as a result of topography static-progressive gradient-vorticity Rossby waves, becomes obvious. Gradient-vorticity waves are known to be horizontal transverse waves with westward propagation, which can be detected in system of poleward currents occurring in crests and troughs of these waves and identified in sea level fields due to convergence and divergence of these currents. Sea level variation phenomenology description in geostrophic approximation can be based on static-progressive wave model displayed as ζ=Acos(mx) cos(ly)cos(σt-kx-ny), where t – time, x, y – rectangular coordinate system values, σ – frequency, k, n – zonal and meridional wave numbers, m, l – modulation parameters, which are inversely proportional to the cell size, A – static-progressive wave amplitude. Particles motion trajectories in proposed model are closed, which is similar to those in vortical structures. In order to explain the observed temperature variations at 100-dbar the heat advection equation should be applied: ∂Θ/∂t=-U (∂Θm)/∂x-V (∂Θm)/∂y, U, V are of the wave nature. It should be mentioned that mean characteristics, which are much greater than temperature pulsations, are being transferred. (∂Θm)/∂x  ∂Θ′/∂x Here Θ′=Θx-Θm, so it can explained by linear heat advection. Thus, we come to the conclusion that water temperature field variability can be determined mostly by gradient-vorticity waves propagation rather than synoptic eddies.



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**Morphological Evolution of the Sakhalin Coastal Lagoons (Sea of Okhotsk)**

*Petr BROVKO (Russian Federation)*

Morphological Evolution of the Sakhalin Coastal Lagoons (Sea of Okhotsk) Peter F. Brovko Far Eastern Federal University Vladivostok, Russia On Sakhalin North-East there is a long and low accumulative shore stretching for more than 200 km. Large lagoons, such as Piltoon (square =420 km2), Nabil (square=181 km2) and Chayvo (square=121 km2), and others are located here. They are separated from Sea of Okhotsk with sand bars up to 3-6 m in height. The lagoons are shallow with 1-4m depth. Between them there are coastal zones (from 2 to 15 km long) with high cliffs and active coastal erosion. Cliffs retreat with velocity of 1-5 m a year. Coastal lagoons are connected with the sea by straits, where depths increase up to 6-8 m and high rates of tidal flows are noticed. Under the influence of these flows and waves lagoon straits are moving along the shore with the velocity up to 30 m a year. Rivers that flow into the coastal lagoons form deltas. Deltas growth leads to reduction of lagoons water area. Lagoons bottom is formed by the sands, aleurites and silts, where the biocenosis are forming in the conditions of low salinity. Significant areas are presented by wetlands, which is typical for coastal lagoons and estuaries. Fishing is widely developed in all coastal lagoons. Sakhalin coastal lagoons morphology and their evolution are studied during long-term fieldwork, made by literary sources and old maps from XIX-XX centuries.



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**Numerical study of coastal processes in Gelendjik Bay, effect of the proposed port**

*Igor KANTARZHI, Mark ZHELEZNYAK, Sergei KIVVA, Pavlo KOLOMIETS, Raisa DEMCHENKO, Maxim SOROKIN (Russian Federation)*

The objective of this presentation is to provide the results of the application of the model chains for the assessment of the wave impacts on new construction designed at the Gelendjik bay, Black Sea coasts and the impacts of these constructions on the coastal erosion/accretion processes. The open source models Wave Watch III and SWAN has been used to simulate wave statistics of the dedicated areas of the Black Sea in high resolution to calculate the statistical parameters of the extreme wave approaching coastal zone. As the main tool for the costal hydrodynamic simulations the modeling system COASTOX-MORPHO has been used, that includes the following models. HWAVE – code based on hyperbolic version of mild slope equations., HWAVE-S – spectral version of HWAVE, BOUSS-FNL - fully nonlinear system of Boussinesq equations for simulation wave nonlinear –dispersive wave transformation in coastal areas. COASTOX-CUR equations with the radiation stress term calculated via neasrhore wave fields simulate the wave generated nearhore currents. COASTOX-SED - the module of the simulation of the sediment transport in which the suspended sediments are simulated based on the solution of 2-D advection –diffusion equation and the bottom sediment transport calculations are provided the basis of a library of the most popular semi-empirical formulas. MORPH – the module of the simulation of the morphological transformation of coastal zone based on the mass balance equation, based on the sediment fluxes, calculated in the SED module. MORPH management submodel is responsible for the execution of the model chain “waves- current-sediments – morphodynamics- waves. The results of simulation compared with the historical observations of the dynamics of coastal area in the various part of the bay.



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**Some Basic Physical Mechanisms Of Sediment Transport In The Nearshore Zone**

*Ruben KOSYAN (Russian Federation)*

When constructing theoretical models of suspended sediment mass transport by water flows, investigators have to face a number of difficulties. Modeling of the sediment transport is limited by the absence of clear physical mechanisms of sediment suspension. The main difficulties of the modeling are discussed in this report. Detailed measurement of mechanisms and time scales of sand suspension by irregular waves were carried out during field experiments at the Black, North and Mediterranean seas and in the biggest in Europe wave channel of the Hannover University. The processes which control the temporal variations in suspended sediment concentrations (SSC) near the sand bottom have been examined by using field measurements of the SSC and the horizontal current components. Measurements during experiments, revealed, that there were fluctuations of concentration in a broad band of frequencies near the bottom. Under the influence of unbroken waves with a typical group structure, the sand suspension occurred in the moments when the high wave groups passed. Consecutive sand suspention under the influence of every wave in those groups resulted in the formation of broad-concentration peaks. The peak-duration depended on the quantity of waves in the group; it was in the order of several tens of seconds. The fluctuations of the sand-concentrations, with the same period as the waves, occurred within these peaks. In this case the concentration spectrum of suspended sand is characterized by a local maximum at the frequency of the approaching waves and by a monotonous increase of the spectral density at the range of low frequencies, when they decrease. The latter can be explained by the fact that the spectrum of the envelope of the cross-shore currents is fairly wide and a local maximum is missing. In the breaking zone, where the group structure of waves degenerates because of energy dissipation, the concentration fluctuations mainly take place in the infragravity wave band. Then, in some cases, significant values of the coherence between concentration and the cross-shore velocity of infragravity waves can be obtained. In these cases, the concentration spectra of the suspended sand have no local maxima and they are characterized by a monotonous increase of the spectral density when the frequency decreases. The observed regularities can be explained by the fact, that the intensity and time scales of sand suspending in the breaking zone depends on the turbulence, which is induced from the water surface under breaking waves. Analyses of the concentration chronograms and the velocity components have shown that the emergence of sharp concentration-peaks is restricted to the moments, when the turbulent fluctuation of the cross- and longshore



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velocity starts. The appearance of such a rise of the turbulent velocity fluctuation and of corresponding peaks of sand concentration usually is not timed to a definite phase of the approaching waves and has no periodicity. One of the difficulties of the suspension modeling is the problem to identify dependence between values of SSC and the form of wave spectrum. The form of wave spectrum greatly influences on the SSC values. With the same wave parameters the spectral steepness can alter the concentration by 2.5 times. The most effective way in the modeling developing is the determination of relations between the suspended sediment concentration and turbulent kinetic energy, between which there are statistically significant values of coherence. To obtain such dependencies, the further research in field and laboratory conditions of spatial-temporal variability of large-scale turbulence and sand suspension under irregular waves is necessary. Experimental investigations of complex and multifactorial processes of suspension requires a special attention to the questions of the experiment planning and realization. It relates both to the choice of research instruments and methods of the result processing. The way out of such a situation is the accumulation of database by means of further experimental investigations supplemented with results of effective mathematical modeling.



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## Soils or sediments in coastal areas?

*Anna TKACHENKO, Maria GERASIMOVA (Russian Federation)*

Recent research on Volga and Don deltaic sediments posed a question on the possibility of regarding them as soils with discernible diagnostic horizons in the same way as it is done for terrestrial soils. This approach is in agreement with the International soil classification; it was first proposed by the famous soil scientist W.Kubiena, and is supported by studies of American, Dutch, and Russian pedologists. Following Russian tradition of soil nomenclature, the subaquatic bodies received an oxymoron name AQUAZEMS. They occur in deltaic near-shore zone and lagoons, fresh-water bays, oxbow lakes, with the water layer above them not exceeding 2 m. Aquazems are studied by augering, and in the core obtained, the layers – horizons are specified by color, texture, boundaries, consistence, plant residues, shell debris, and thickness, which is far less than in terrestrial soils (first centimeters); most common are the aquagley and aquahumus horizons. The latter is mostly formed by residues of rooted plants – lotus and reed with additions or losses of Corg-enriched solids transported by currents and tides. The aquagley horizon resembles that of terrestrial soils, and may also have oxymorphic features. The effects of soil-forming agents (relief, parent rock, living organisms) are similar to those for terrestrial soils, although climate is cool and even, age is small, and there is an additional specific agent – currents, modifying the surface and controlling matter transfer. Perception of the study objects as soils is helpful for assessing their environmental functions.



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## Different-time dynamics of Anapa bay-bar coast line

*Viacheslav KRYLENKO, Marina KRYLENKO, A. ALEYNIKOV (Russian Federation)*

The series of space images were analyzed to get pictures of Anapa bay-bar coast (Russia) for the long period of time. Anapa bay-bar is an accumulative sandy object with the length of 47 km. The width of the bay-bar varies from 100 m in the northern part up to 1.5 km in the southern. The strip of sandy beaches of 50-200 m width has a huge recreational value. Chronological series of the aerophotography and satellite pictures are a reliable basis for monitoring of long and fast changes of the coastal line and other elements of the coastal zone, especially on a very dynamical accumulative coast. Their analysis allowed to receive the detailed information about changes of Anapa bay-bar during last 74 years and to connect them with natural and anthropogenic impacts on the coastal zone. Processing and analysis of the Anapa bay-bar images showed that there are areas with different values of shoreline shift. The greatest coast retreat is noted in the north western part of the bay-bar. The minimal one-in the south-eastern part. Maximum total coastal retreat from 1941 to nowadays is 80 m, the maximum retreat from 1966 is 40m. Amplitude of the between-stormy variation is up to 25m. Thus, the annual variability of coastline position is comparable with the decade variability. The work is carried out under financial support of the RFBR № 13-05-96510, 13-05-00466, 15-07-02654, RSF № 14-17-00547



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**Coasts Dynamics Of The Red River And The Kuban River Deltas**

*Marina KRYLENKO (Russian Federation); Nguyen Thi Viet Lien, Nguyen Man Hung*

Usually, the widespread coast retreat is associated with sea-level rise and the deficit of solid material in the coastal zone. It is consided as a global feature of coastal processes. This phenomenon causes the activation of erosion processes in the coastal zone. The most rapid and significant changes are characteristic for accumulative sandy coasts. The role of natural and anthropogenic factors for the Red river and the Kuban river accumulation delta coasts modern dynamics is characterized in this presentation. The Kuban river delta occupies almost half of the east coast of the Sea of Azov (about 160 km). The Kuban delta coast dynamics depends mainly on the wave mode, surges, solid runoff reduction because of construction of the water-storage reservoir, the amount of shell material. The Red River is the second largest river in Vietnam. The length of the delta marine edge is 200 km. The Red River delta coast modern dynamics is characterized by combination of accumulation processes and wave erosion. The wave impact increasing (due to the activation of typhoons and sea level rising) and solid runoff decreasing are the basic causes of the delta coast washout. Thus, dynamics of the delta coasts in different geographic conditions is determined by the mainly similar factors. The work is carried out under financial support of the RSF № 14-17-00547; RFBR № 15-07-02654, 14-05-93000.



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**Mapping of Blagoveschensk part of Anapa sand bar landscape-morphologic structure by high-resolution satellite images**

*Valentina KRAVTSOVA, E.R. CHALOVA, A.A. FALALEEVA (Russian Federation)*

The Anapa sand bar at the Black Sea coastal zone is now one of not numerous sand beaches in Russia. Sand bar includes three main belts: beach belt, dune belt and hillock sands. Dune belt and hillock sands suffer from a strong anthropogenic impact, landscape-morphological structure of dune belt is disturbed, so monitoring of the sand bar is essential . For this purpose we had compiled a series of maps of landscape-morphological structure for three test sites at Blagoveschensk part of sand bar using high-resolution images from WorldView-2 satellite. Interpretation of stereo-pairs of multitemporal images was carried out in scale 1:2000, a series of maps was compiled in scale 1:5000. Three regions covered by these maps are characterized with different coastal conditions. At the first one sand bar throws to cliff, at the second it goes away from cliff, and at the third sand bar borders near-liman lowland. It caused different degree of sand dunes belt development , shown at maps . Test sites are also characterized with various degree of anthropogenic influence. It depends on solutions of people's restoration organization, it may be construction of special bridge-ways to the sea or free admission to beach through dunes. The maps will help to investigate adaptive solutions for Anapa sand bar conservation and defence.



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**An Evolution Of North-East Sakhalin Coastal Barrier (By The Example Of The Plastun Sand Spit)**

*Igor LEONT'YEV, Tatiana AKIVIS, Victor AFANAS'EV (Russian Federation)*

The investigation is concerned with a coastal barrier that separates the tidal inlet Nyivo from the Sea of Okhotsk. The southern part of the barrier to the south of the Anuchin strait is called the Plastun Spit while the northern one is called the Island of Gafovich. The region under investigation features intensive hydrodynamics with tides and storms. Its distinctive characteristic is progressive elongation of the Plastun Spit and northward migration of the Anuchin strait (1760 m for the last 60 years). For greater understanding of the observed dynamics the alongshore sediment fluxes were computed using the bathymetry and wave data. It has been found that the bottom topography affects wave refraction and results in significant flux changes along the coast line. In particular the shallow area of the Anuchin strait near the ebb delta of the system of tidal inlet Nyivo has an appreciable effect on sediment transport. The fluxes decrease near the spit end and increase to the north of the Anuchin strait that leads to sediment accumulation and coastal erosion, respectively. So the end of the Plastun Spit is the accumulative zone while the Island of Gafovich is prone to erosion. The alongshore sediment flux feeds the spit with the material eroded from the Island of Gafovich. The southern part of the island loses its material and gradually retreats to the north. The results obtained help to explain the observed migration of the Anuchin strait. The erosion and accumulation zones apparently migrate following the straight thus sustaining the process. The work is supported by RSCF (Grant № 14-17-00547).



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**Method of wave-driven cross-shore sediment transport prediction**

*Margarita SHTREMEL, Yana SAPRYKINA, Sergey KUZNETSOV (Russian Federation)*

Waves are the main source of energy in coastal zone. When propagating to the shore, waves are transformed due to nonlinear near-resonant triad interactions. The main feature of said process is spatial periodic exchange of energy between nonlinear wave harmonics that leads to changes in wave asymmetry and, as a result, to cross-shore relief changes. So prediction of sediment transport under wave action is very important for all tasks of dynamics of coastal zone. Usually for this purpose a numerical modeling is used. In our work simple method of maximum value of cross-shore wave-driven sediment transport prediction depending on mean bottom slope values and input wave parameters is discussed. This method is based on following steps: 1) Definition of typical scenario of wave transformation (or number of periods of changes of amplitudes of nonlinear harmonics) in coastal zone using Iribarren number as a criterion 2) Calculating sediment transport maximal values using Bailard's formula modified by I. Leontiev based on parameterizations of second harmonic maximum value and biphase (phase shift between first and second harmonics) for typical scenarios of wave transformation. The method of coastal zone classification depending on wave impact was applied to selected areas of Baltic Sea and Black Sea. Acknowledgements This study was supported by RFBR grant 14-05-31058, 15-05-04649, 15-05-08239 and Project of Russian Science Foundation 14-17-00547.



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**Modeling of storm wind waves in the Sevastopol Bay of the Black Sea**

*Vladimir FOMIN, Dmitriy ALEKSEEV, Lyudmila KHARITONOVA, Elena IVANCHA, Dmitriy BORODIN, Dmitriy LAZORENKO (Russian Federation)*

Computer modeling system of wind waves is developed for the Sevastopol Bay of the Black Sea. System is based on SWAN (Simulating Waves Nearshore) model and nested grid technique, which includes four nested domains. Atmospheric prognosis, obtained from WRF (Weather Research and Forecasting Model), is used as atmospheric forcing. To study process of wind wave penetration from the north-west region of the Black Sea into the Sevastopol Bay five storm situations occurred during 2013 – 2014 years are considered. As the most of storms in the Black Sea region these ones were caused by atmospheric disturbances of cyclonic type moving from the south-west and west. It is shown that most significant wind waves in the Sevastopol Bay occur on the final stage of atmospheric disturbance passing when west and north-west wind predominate. This is a result of zonal orientation of the bay with entrance on the west. Under the effect of west and north-west winds intensive waves penetrate along the bay axis up to the east boundary. But between the Artileriyskaya Bay and the South Bay and in the North Bay (inner bays of the Sevastopol Bay) there are local regions where intensive waves reach the south and north coasts correspondingly. The Sevastopol Bay has the southern and northern piers near its entrance. It is shown that protective effect of the piers is observed in the west part of the bay only and the wave attenuation near the southern coast is more significant than near the northern one. The area of the southern coast directly behind the southern pier is completely protected from the storm waves and, as moving away from the pier, the danger of intensive wave effect on the coast is kept. The reported study was partially supported by RFBR, research project No. 14-45-01037 р_юг_а.



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## Mean Sea Level – What are the Recent Changes Along the Texas Gulf Coast?

*Alexey SADOVSKI, Gary JEFFRESS, Philippe TISSOT, Scott DUFF (USA)*

Mean Sea Level is defined By NOAA's National Ocean Service (NOS) as "The arithmetic mean of hourly heights observed over the National Tidal Datum Epoch (the latest being 1983-2001). Shorter series are specified in the name; e.g. monthly mean sea level and yearly mean sea level." Where sea level is changing, NOS now computes updated tidal datums, including Mean Sea Level, when a five-year mean varies from the published Epoch value by more that 3 centimeters. Data of monthly mean sea levels (2000-2014) provided by 11 Texas Coastal Ocean Observation Network (TCOON) stations along Texas Coast of the Gulf of Mexico have been used to find running averages for 5 years and compare these data to the published Mean Sea Level for each station. Data was also subjected to factor analysis (main components), which demonstrated that there are two main factors explaining variations of the see levels: one could be interpreted as regional and a second factor with significantly less weight could be interpreted as local. The first factor is showing increases with most recent data for 5-year running averages, while the input of the second factor is somewhat steady. Using 4 factors allows consideration of local causes in Mean Sea Level change; the land subsiding at differing rates along the Texas coast may be one explanation of local variations of the mean sea level.



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# Coastal **zone dynamic of Kaliningrad Peninsula northern shore**

*Nikolay LUGOVOY (Russian Federation)*

The most dynamic landforms of the studied coast are sandy beaches. Those are formed at the base of cliffs partly covering shore platforms developed in low-resistance bedrock. Only glacial boulder loams are characterized by relatively higher resistance to wave action. Sediment supply from rivers or from sea bottom erosion is minimal. A significant portion of sediment delivered onto the beaches from the underwater offshore slope during moderate waves periods is represented by sand previously washed away from the beaches and cliffs during heavier storms but still remaining above the coastal zone lower limit. Main source of sediment for beaches are wave erosion and denudation of cliffs. Abrasion occurs only during heavy storms with typical return period exceeding one year. During periods of low to moderate wave intensity it in most cases affects colluvial fringes and landslide bodies accumulated along the cliffs toes rather than cliff faces themselves. Other processes acting on cliffs, mainly landslides, falls and screes are main contributors into the coastal zone sediment budget. Runoff erosion processes on cliffs are not intensive. Colluvial material deposited along the cliff toes is sorted and redistributed by waves and currents. Beach topography experiences active and frequent transformations often at opposite directions. However certain zones can be distinguished where beaches are relatively stable and others dominated by beach degradation in longer terms. At some coastline sections sandy beaches become washed away completely and replaced by shore platforms armored by cobbles and boulders. In most cases such zones are associated with artificial coastal protection structures with wave-reflecting effect such as embankments walls, landslide-prevention belts or gabions.



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# Cultural Regionalism and Regional Identity

## Cultural Regionalism and Regional Identity 1

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- Eastern Ukraine through the perspective of historical narratives, political discourses and local identities

  *Anton GRITSENKO (Russian Federation)*

- Ethnic stereotypes of the Border region population (Kursk oblast)

  *Lyudmila POPKOVA, Ann POPKOVA (Russian Federation)*

- The Transformation of Ethno-Cultural Space of Russia in the Post-Soviet Time: Inter-Regional Dimension

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  *Chien-ping LEE (Taiwan (China))*



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## POSTER EXIBITION

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- Sociocultural limitations of humanity's movement to noosphere
  *A.B. SHVETS, A.N. YAKOVLEV, D.A. VOLKHIN (Russian Federation)*
- The regional identity of Kirovskaya oblast as a factor of investment attractiveness
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# Eastern Ukraine through the perspective of historical narratives, political discourses and local identities

*Anton GRITSENKO (Russian Federation)*

After Ukraine gained its independence (1991), it set about creation of a new national identity. The concept of Ukrainian ethno-political nation was accepted as the desired outcome in the nearest future. One of the political slogans became as follows: "one country – one nation – one language". Missing element in this triad is a unified national history. Post-colonial interpretation of history became the dominant in political discourses, which together with ethnocentric understanding of the Ukrainian nation has led to distribution anti-Russian rhetoric in public and political circles. However, for residents of Eastern Ukraine, Russia has always been a "significant other", and the high Russian culture and Russian language has always been a part of local identity. In addition, the "Soviet vision" of history, some features of the Soviet mentality and memory are not completely disappeared there and they are still shared by many people. The report will be devoted to analysis of the relationship between local identities, historical narratives and political discourses, as well as their regional dimension in the Eastern Ukraine which was investigated by author (including in field-work) with support of Russian Science Foundation (grant №14-18-03621).



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**Ethnic stereotypes of the Border region population (Kursk oblast)**

*Lyudmila POPKOVA, Ann POPKOVA (Russian Federation)*

The peculiarities of the ethnic population ethnic composition, a long- term experience of living on the same territory, intermarriages, work with in the same teamstaff, borrowing of traditions in household activities, experience in husbandry. All these factors effect affect the ethnic identification of the population, which can be measured by the ethnic stereotypes. Questionnaires to population from different boarder settlements (which which differ in in size, functions, location) show the level of ethnic stereotypes formedness of ethnic stereotypes. The main principle of the definition of the emotionally evaluative component, which is dominant in the structure of the ethnic stereotype, let us measurement measure of the parameters such as: ambivalence, intensity and orientation. These parameters are good accountthe main components of the ethnic stereotypes, evaluations of their ' figurativeness'. Strong concentration of sub-ethnic characteristics is peculiar usual for to the immediate boarder area. With distance from the boarder, sub-ethnic characteristics change to 'standard' national criteria. Boarder region is represented by the zone of dying out sub-ethnic qualities. The most ethnic tolerant is non-urban area. Stereotypes are less shown and are positively oriented in the medium size towns and big cities. Most conflict in respect to ethnicity are small size towns and urban-type settlement The research in the area of ethnic stereotypes shows the necessity and importance of the implementation of ethno psychological approach in socio-geographic researches. This research helps to understand complex and diversified processes on deep level, which that are carried out while territory development by the representatives of closely related ethnos.



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**The Transformation of Ethno-Cultural Space of Russia in the Post-Soviet Time: Inter-Regional Dimension**

*Vladimir STRELETSKIY (Russian Federation)*

This paper is devoted to consideration and analysis of main ethno-geographical and cultural-geographical shifts in Russia after breakdown of the USSR. Research background embraces official data of Population censuses 1989, 2002 and 2010, concerning ethnic composition and demographic structure of the population of Russia and its administrative units, the previous published scientific works devoted to ethno-geographical and cultural-geographical issues as well as results of some sociological polls illustrating changes of ethnic and regional identity patterns in Russia after the collapse of the USSR. The main trends of ethic demography, ethnic migrations and ethnic settlement dynamics during different periods of the Soviet and Post-Soviet history of Russia are elucidated. The indices of the share of "titular" ethnic groups in the total population of national republics of Russian Federation as well as indices of their spatial concentration are calculated, compared for various census years and interpreted in the context of the long-term geographical shifts. The special emphasis is made upon the small-numbered aboriginal ethnic groups of the Russian North, Siberia and the Russian Far East focused on explication of their demographic dynamics, cultural transformation processes and ethnic settlement trends. Phenomenon of regional / local identity as one of the key driving forces of cultural regionalism in Russia is analyzed. New patterns of multiculturalism in Russia in the late 20th – early 21st centuries are revealed and exposed: 1) revival of regional and local identity in various parts of the country; 2) gradual increase of cultural-geographical distinctions within the space of Russian ethnic settlement; 3) reestablishment of "horizontal" links between social groups consolidating regional communities and strengthening regional interests of people and regional identity.



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# Landscape of the Ethnic Group Formation and Complementarity of Ethnic groups as a Foundation of the Regional Identity Formation

*Tatiana GERASIMENKO (Russian Federation)*

The landscape's role and the role of attraction of ethnic groups in the formation of ethnocuitural regional specificity and regional identity are represented in this presentation. The borrowing of culture's elements is originated in the process of mutual contacts. The ethnic groups are interacting and adapting in the landscape and as a result, the ethnic cultures have common features and regional identity. The presentation is illustrated by specific examples. Author emploed the resalts of her own field research.



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## Multiple territorial identity: Arctic and Post-Modernity

*Nadezhda ZAMYATINA (Russian Federation)*

Territorial identity is usually seemed as one of the key factors of local economic development. From this point of view the communities of old-time citizens develops more sustainable and they are managed more careful than those combined from new-arrivers. This approach has many confirmations. But Arctic gives us a lot of examples of communities of young cities which are managed very careful and effective in spite of their newly arrived population. Sometimes newcomers, frontier pioneers ("pervoposelentsy") have much more drive to develop their settlements than old-time citizens. What is especially interesting that the former Northerners after their migration from the North to the perfectly new place become usually the most active actors in the development of these new place. So the deep place identity is not necessary for careful action to the place and place development. By the way the people of Russian Arctic have very special territorial identity. It looks like the identity is divided between a place in Arctic and a place or even a couple of places in the southern part of Russia. We see here one of the modern tendencies of Post-Modern period: the break of the unique identity and the tendency of different identities to co-exist for the one person. This tendency is just studied for the case of personal identity. But we stress the same tendency for the territorial identity and Arctic is a good field to study it. Such a tendency plays a great role in the re-thinking of regional policy. The close tie between the birthplace and the attendance to the place, between the "heimat", motherland and the topophilia tends to be broken. The new topophilia is based on the tie between the place and the long individual biography, individual living-path. The sense of ownership, the sense of opportunities opened by a place matters here. The research is based on the field materials and the research of the internet forums of Russian Arctic cities.



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**The social life of pineapple: Food, cultural politics, and symbolic commodification**

*Chi-Shan CHEN (Taiwan)*

Over the past decade, many food studies have focused upon the alternative food with economic approach both by the combination of actors in the system and by their sets of relationships with non-local actors and agencies. Despite receiving significant attention, the meaning and effort beyond the food production and commodification has not been revealed. Pineapple industry development in Taiwan could be dated back to the Japanese colonial period with canned mainly from exported around the world. Owing to the global politics and economy changes, the pineapple has produced into pastry commodities with Taiwan identification. This research applied cultural approach to pineapples, tracing its social life through an historical account of its transformation from the staple food of the profitable can processing to its introduction as a speciality component of Taiwan culture. Pineapple has changed from cash crop to cultural innovative commodity during past fifty years. This essay explores how this process happened and how Taiwan has reshaped its landscape and agricultural industries in the face of the globalization process. Resulted from state intervention, the pineapple changed its commodification formed relational spaces with foreign markets and reshaped new rural landscapes. By examining the relationship between commodities and our discourse, practices, and assumptions about food, this case demonstrates that food represents a convergence of economic , social, cultural, political, and moral dimensions and it also provides a powerful lens through which to trace and illustrate the interconnectedness between material and symbolic exchange around the world. Keywords – Taiwan pineapple, rural development, embeddedness



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# A reflection on the "new" regional geography in research on the identities of intensively changed areas in Czechia

*Pavel CHROMY, Zdenek KUCERA, Miroslav SIFTA (Czech Republic)*

The so-called "new" regional geography has reached middle age. For four decades, we have witnessed intense debates in geography as well as in related social sciences (sociology, political science, economics, historiography, etc.) concerning the (re)conceptualization of region and place. At the core of these debates is the understanding of region as a social construct and a socio-spatial process. Not only the significance of people's sense of belonging to the territories they inhabit, but also external and internal images of areas, conditions for and broader contexts of creation, reproduction, and disappearance of regions are given attention. Finnish geographer A. Paasi's theory of the institutionalization of regions (1986) is one of those that have significantly contributed to recent growth of interest in regional identities. Ideas of the new regional geography were reflected in Czech geography with a delay of more than one decade. The paper has three goals, to: 1) reflect upon more than ten years of research on territorial identities in Czechia in an international context; 2) discuss reasons for and the contribution of research on identities to geography; 3) discuss interdisciplinary nature of research as a platform for understanding developments in territorial differentiation. Moreover, current research on the forming of territorial identities in problem areas of north-western Bohemia will be presented with an emphasis on the socio-spatial and cultural-historical contexts of the transformations of these regions. In conclusion possible directions, themes and opportunities for future research will be outlined. Preparation of the paper was supported by Historical Geography Research Centre (GACR P410/12/G113).



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# The construction of environment by culture – German-Russian research project on perception of cultural landscape

*Diana DUSHKOVA (Russian Federation), Sebastian LENTZ (Germany)*

In sustainable regional and landscape development research, cultural aspects are rarely or only selectively and unsystematically analysed. However, cultural aspects are of great practical relevance, particularly in urban areas, where past human activity has markedly contributed to the diversity of the environmental changes. Cultural factors, such as a sense of place as well belonging and the desire to protect the region in which one lives and finds valuable and aesthetically pleasing, are common incentives that have led to the improvement of the environment situation and the formation of sustainable cities. In our research we examine how consequences of landscape changes are perceived by their inhabitants and impact space-oriented identification. In a strictly constructivist sense the perspective can even be turned around and landscape, as open to research in Social Sciences, has to be searched within the people, within the meanings which they ascribe to natural and artificial objects in space. So, landscape perception was obtained through semi-structured open-ended interviews with respondents living in two regions – Kirovsk in Khibiny Mountains of Murmansk Oblast (Russia) and Lutherstadt Eisleben in Mansfeld Region of Saxony-Anhalt (Germany). The results show a wide variety in landscape perceptions, but also some similar characteristics in the two case studies. The latter allow conclusions on fundamental patterns in the ways landscape is perceived through a framework of historical experiences and values. In particular, they emphasise the importance of persistent elements of cultural landscapes in and around (post-)'socialist cities' and the productive power of individual and collective memories.



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## The territory identity transformation of Berlin citizens after reunion of Germany

*Irina KRASNOPEROVA (Russian Federation)*

This article is dedicated to geographical aspects of identity transformations that were faced by citizens of Berlin after reunion of Germany. The purpose was to research the processes of territory identity transformation of Berliners and changes that occurred in the society after the unification of Germany, especially in the capital. The emphasis is placed on identification of the changes that happened in the minds of Berliners, in perception of the western and eastern parts of the city during the research period. Such features have a strong influence on formation of the Berlin image in citizens' and also at guests' minds. The paper is based on materials of the field research conducted in February 2015 in Berlin, that included mental maps and interviews. Basic elements of the urban landscape, which form perception of the city by its inhabitants, were defined. Particular attention was paid to the presence and significance of the border between West and East Berlin in the minds of people. It's shown, that even after 25 years of the city reunion the border still exists and is comparable in importance to other elements of the urban landscape.



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# Yuri Gagarin, Abay Kunanbayev, and Karlag: Monuments and Memory in the Landscapes of Karaganda

*Robert KOPACK (Canada)*

This discussion paper looks at the interplay between heroic national achievements of the Soviet period with those generally considered to be the most vile, how built landscapes are formed around statues and commemorations, how these co-constitute public spaces like parks, and how oppositional symbols conspire to complicate any clear understanding of the "post-Soviet." While, cultural and economic developments in the nation's capital, Astana, represent a new beginning and a radical break from the Soviet past, Astana, with its grandiose and spectacular new urban landscapes obscures other important cities in Kazakhstan. The Soviet past is not so easily built over, forgotten, nor is that necessarily the intention. My central geographic concerns with Karaganda are the ways in which the past is invoked in the built landscape and I argue that what is taking place is the simultaneous elevation and condemnation of the Soviet past. There are particular, albeit conflicting values, to the twentieth century and to Kazakhstan's national identity. Karaganda's Soviet lineage is undeniable and utterly visible in both a strikingly positive, as well as a negative, sense. This is in large part due to the statues, commemorative sites, murals, public art, and other sites of memory in the city. The interplay of objects, landscapes, histories, and sentiments provides an opportunity to reflect upon the Soviet and post-Soviet period and how we understand and conceptualize the geography of the Kazakhstan, Eurasia, and the former Soviet Union.



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# The relationship between the levels of territorial identity in Russia: potential of integration and conflict

*Maria NAZUKINA (Russian Federation)*

The report aims to study the problem of correlation between the levels of territorial identity in Russia. This issue is important for Russia, where in conditions of the ongoing «crisis of identity», are actively taking the processes of regionalization and localization. In the report implementation will be identify and analyze, different ratios of territorial identities, the factors that determine their configuration. As a criterion of simulation of possible types of relationships is considered the degree of interpenetration of levels and the potential conflicts between them. In terms of multiplicity of identities struggle on the question, which one is the "main" and acquires political significance, never stops, and at any given moment you can find some value different identities. National, macro-regional, regional and local levels may be present in varying proportions. Today, there are grounds to speak about the options integrated ratio territorial identities. This is evidenced symbolic politics of regional elites who are trying to position the territory through the integration of regional features in the cultural-symbolic space of the country. The novelty of the tasks is that the phenomenon between levels of territorial identity has not yet been the subject of special research. So far, the study has had only separate aspects of this problem: the ratio of national and regional identities, specificity, and construction of a regional identity in Russia.



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# The Role of Graphical Symbols in the Place Representation: the Case of Municipality Policies in the Liberec Region (Czechia)

*Miroslav SIFTA, Pavel CHROMY (Czech Republic)*

Topics of spatial identity, image of place, place branding/marketing and representation are increasingly interconnected to each other and discussed in current regional and cultural geography. The paper analyzes the role of graphical symbols in the local representation and in local identity formation processes. The extent of graphic symbolism utilization by local municipality actors in the region, its importance for the image formation of the place/municipality from the local development actors point of view and assessment of the degree of identification with the municipal characteristics among the local population are evaluated. These questions are investigated according to the results of the survey targeted at municipal representatives (May–July 2014), and municipality emblems analysis (171 emblems of municipalities in Liberec the region). Landscape and natural symbols are the primary symbolic representations of whole region. Historical symbols, whose importance varies in time, are the second most often reflected symbols in the graphical symbolism. These play the role of connecting, mediating and activating factors on the regional level. In contrast, close-meaning municipal symbols tend to (and also should) have rather a representative function. But these are still not used enough and in the right way by actors of municipality representations.



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## La géographie culturelle du riz à Taïwan

*Flora Sheng-hua CHENG, Patricia NGUYEN (Taiwan (China))*

La présente étude est une recherche en géographie agricole et culturelle. Comme le géographe français Pierre GOUROU l'a écrit: " .... les minutieux paysages de rizières et les hautes densités de population de ces régions ne pouvaient s'expliquer que par les vertus de l'encadrement social inhérent aux civilisations de l'Asie sinisée." Depuis la préhistoire, Taïwan a toujours été un lieu d'habitation pour les Austronésiens. A partir du IIIe siècle, les Han arrivent successivement de Chine et à partir du XVIIe siècle, ils viennent massivement s'installer à Taïwan. Bien que Taïwan ait été colonisé par les Pays-Bas et le Japon, respectivement pendant les périodes 1624-1662 et 1896-1945, dans les plaines et les régions vallonnées, le genre de vie des Han est resté principalement fondé sur la riziculture. La production de riz à Taïwan est d'environ 1,6 millions de tonnes (en 2013), ce qui représente seulement 0,2 % de la production mondiale. Néanmoins Taïwan possède des techniques avancées en riziculture et conserve un nombre considérable de semences sauvages et cultivées. Au siècle dernier, environ 282 variétés de riz ont reçu leur nom d'experts basés à Taïwan. Les systèmes d'irrigation à Taïwan combinent les technologies traditionnelles et modernes et Taïwan conserve de riches traditions culturelles liées à la culture du riz, par exemple les toponymes associés à la riziculture ou encore les aliments à base de riz et le vin de riz consommés pendant les festivités, à l'occasion desquelles sont aussi cités ou récités des poèmes évoquant le riz. Ces dernières années, avec le développement du tourisme, on voit également apparaître dans les rizières des créations artistiques réalisées avec différentes variétés de riz. Mots-clés : variétés de riz ; traditions culturelles liées au riz ; systèmes d'irrigation importants ; toponymes liés à la riziculture ; aliments festifs, vin de riz et poèmes bachiques liés à la riziculture ; créations artistiques dans les rizières



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**Place Attachment and Belonging among Educated Young Migrants and Returnees: The Case of Chaohu, China**

*Huimin DU (China (Beijing))*

This article explores how geographic mobility is implicated in the process of bonding with place. By using data collected from a survey on a group of college graduates, who grew up in Chaohu and left the native place in their young adulthood, four types of migrants (Translocals, Departers, Aliens, and Settlers) and three types of returnees (the Trapped, the Bonded, and the Rooted) are classified. This research acknowledges the significance of traditional influence in people's bonding with places, and meanwhile challenges the conservative view of seeing attachment/belonging to the homeland as universal and unconditioned. The findings also show that educated young migrants tend to have a greater desire to be integrated into the host city and they are more prone to be accepted by the new socio-spatial environment. Taken together, this study corroborates the idea that geographic mobility does not undermine place-based attachment/belonging, but tends to attenuate its intensity. Attachment/belonging is not necessarily limited to one single place; yet, attachment/belonging ascribed by birth still has advantage over that acquired by residence.



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# Reading Cultural Landscapes from Postmodern Perspectives: a case of the Nanyao Temple, Changhua, Taiwan

*Chien-ping LEE (Taiwan (China))*

Since the development of the cultural turn in the 1980's, fundamental geographical concepts of region, space and place have gained their focal position on the stage of studying regional cultures. Cultural landscapes are perceived as a multidimensionally flowing process amid spatial practices of everyday-life world from diverse perspectives. Besides thoughts of environmental perception and humanism earlier, postmodernism has been introduced to deconstruct and reconstruct the map of meanings through complex factors of politics, economy and social organizations. The study attempts to read, analyze and interpret a case of the Nanyao Temple as a religious landscape from postmodern perspectives to reveal multicultural meaning and identity construction of this space of faith. First, the development of cultural geography is highlighted. Then, postmodernist perspectives and landscapes are discussed. Finally, the cultural significance and styles of the Nanyao Temple are explored and analyzed. Research methods include text analysis, field study and concept discourse. Key words: Regional cultures, cultural geography, religious landscape, postmodernism, identity, Nanyao Temple.



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IGU2015 – 0883

## Cultural Regionalism As A Prerequisite For Spatial Economics

*Aleksandr LEVINTOV (Russian Federation)*

Cultural Regionalism As A Prerequisite For Spatial Economics Geographical division of labor has existed from early times and its main negative consequence was the separation of people. To overcome this separation and the inability to live together people had to develop the idea and institutions of justice (courts, laws, etc.) The complexity is a reverse of geographical division of labor and specialization while by complex we mean naturally emerging and interrelated combination. It can be said that specialization generates competition and aggregation generates cooperation on the basis of nature and naturality of complex and because of the phenomenon of reciprocity, which is typical for the biological and social communities. The division of labor has given birth to barter and later, to trade. A long discussion about the genesis of trade: is it from excess or deficiency? – is called short by the recognition that foreign trade is primarily based on excess of one or another product, inevitably becoming an object of trade, and the interior trade is primarily based on deficiency, in which products are mainly arise from the idea of service. Man isn't only the measure of all things (Protagoras), but also is the equivalent to them. In general, first objects of trade were creatures - because of their mortality: animals, birds, prisoners of war, women as a means of biological reproduction. That is why trade has stimulated the war. Because of their eternity non-living things played the role of money in the exchange. This first primitive division still isn't completely dead. Geographical originality of cultures and the untranslatability of cultures is the most important factor of placement, exchange and trade. The idea of universal originality can also be considered as a cultural factor of accommodation, if we remember that the word "culture" means "method of cultivation the land" and, therefore, recognizes the uniqueness of each natural place as well as the uniqueness of the human experience, traditions and skills. Consumer idea of placing which arose in the 16-17th centuries is relevant to the present day as a dominant of market economy. Further the following questions are considered: - private property and division of labor - division of labor and technologization - society polyhierarchies and personality perispherity.



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## Sociocultural limitations of humanity's movement to noosphere

*A.B. SHVETS, A.N. YAKOVLEV, D.A. VOLKHIN (Russian Federation)*

Modern Russian geography recognizes the necessity of critical attitude towards the conception of sustainable development that has been introduced in its scientific community. In this conception there is no answer to the main question: how countries with different stage of development can find their place in the world economy in the conditions of limited world resources. As an alternative to sustainable development Russian geographers put forward the conception of noospheric development which will allow to formulate a constructive scenario of world development. The limitation of perception of the noospheric conception at the level of human psyche is absence in different cultures of the modern world of unanimous opinion as to the basic values and aims of human existence. In the society this situation gives rise to sociocultural conflicts that are revealed in the confrontation of different actors because of discrepancy of their ethnic and religious identities. Intensity of sociocultural conflicts depends on the degree of manageability of the country's information field. Manageability of the information field is observed in the texts that interpret conflict situations and in the appearance of image characteristics of conflicting parties. Geographically we suggest to study sociocultural conflicts through the structures of unsustainable development. By the structures of unsustainable development we understand spatially localized situations, reflected in the information sphere, and latent life situations of confrontation between subjects with different interests and values. The geographers' task is to develop the typology of socio-cultural conflicts at different spatial levels to comprehend the noospheric and geographical picture of the world.



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## The regional identity of Kirovskaya oblast as a factor of investment attractiveness

*V.A. KLOCHKOV, G.D. MUKHIN (Russian Federation)*

The regions' rivalry for investments gets the important significance because of economic depression and finances' deficiency. Creating more favorable investment climate is the main challenge for regions. Investment attractiveness is determined by balance between investment potential and investment risk. According to Expert Rating Agency Kirovskaya oblast is related to "Lowered potential – moderate risk" group of regions as investment rating in 2013-2014 . Investors appreciate infrastructure, production, labor and consumer potentials first of all. Among main risks investors consider legislative, financial, administrative ones. The attractive factors for investments in the Region: a profitable geographical position, qualified labor resources, available forest and land resources, high nature and recreation potentials, high regional consciousness. However rather high investment potential in forestry and agriculture can not be implemented because of scare infrastructure. Underdeveloped infrastructure prevents natural environmental recreation resources mobilization as well as for cultural and ethnical self-identity of the region. Social problems: relatively low and slowly increased incomings, intensive depopulation and aging, especially as rural population, constant migration loss, low level of social services in rural districts, underdeveloped transport infrastructure. Economic problems: large number of municipal units with monoprofile economy structure, lack of fuel, power and other export resources. Thus existing regional economy structure is characterized by lack of sectors favorable for external investments. There is only one big federal project on production of pharmaceutics at the base of nanotechnologies in the Region now. Under such conditions the mobilization of inner investment sources is urgent requiring changes in budget tax formula for use of the Region.



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# Evolution of Earth Cryosphere in changing climatic conditions and under a human-induced disturbances

## Evolution of Earth Cryosphere in changing climatic conditions and under a human-induced disturbances 1

**Chairperson(s):** *Victor POPOVNIN, Dmitry STRELETSKIY*

- Permafrost thawing implications in the settlements of Eastern Chukotka

  *Alexey MASLAKOV (Russian Federation)*

- Gas-emission crater in Central Yamal: relief dynamics based on satellite images analysis

  *A.I. KIZYAKOV, A.V. SONYUSHKIN, M.O. LEIBMAN, M.V. ZIMIN, A.V. KHOMUTOV (Russian Federation)*

- Climate Change, Permafrost Degradation and River Hydrology

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- Dynamics of permafrost conditions in the largest cities of Russian Arctic under climate change and technogenic impacts

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- Climate vs. human induced impact on the cryosphere in the Ak-Shyirak massif (Inner Tien Shan)

  *Dmitry PETRAKOV, Alena SHPUNTOVA, Alexandr ALEINIKOV, Markus STOFFEL, Ryskul USUBALIEV (Russian Federation)*

## Evolution of Earth Cryosphere in changing climatic conditions and under a human-induced disturbances 2

**Chairperson(s):** *Victor POPOVNIN, Dmitry STRELETSKIY*

- Methane in the ground ice as a proxy of evolution of permafrost in the West Siberia

  *I.D. STRELETSKAYA, A.A. VASILIEV, G.E.OBLOGOV, V. A FEDIN (*(Russian Federation)*)*

- The Age Of Cryogenic Microrelief In Subarctic Mountains

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- Coastal dynamics at the Pechora and Kara Seas in changing climatic conditions and under a human-induced disturbances

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- Lacustrine thermokarst dynamics analysis based on remotely sensed data and methods of



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mathematical morphology of landscape

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- The identifying of dangerous areas of corrosion of gas pipelines in permafrost regions

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  *Nella SHPOLYANSKAYA (Russian Federation)*

- Interregional technical cooperation project Project (2014-2017)

  *Bulat MAVLYUDOV (Russian Federation)*



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**Permafrost thawing implications in the settlements of Eastern Chukotka**

*Alexey MASLAKOV (Russian Federation)*

Eastern Chukotka is a region populated mostly by indigenous peoples - Chukchee and Eskimos. The settlements considered in the study are Inchoun, Neshkan and Uelen, situated on the Chukchi Sea coast; Lorino and Lavrentiya situated on the Bering Sea coast. «New» facilities in them been weakly adapted to exploitation on permafrost and had been having negative, but non-critical impact on frozen grounds. Since 1990s, socio-economic situation has changed, and consumer service of engineering systems has deteriorated. In addition, climate changes have complicated the situation. This had led to building deformations, geotechnical risk increasing and intensification of negative cryogenic processes. The study methods are geophysics, thermal modeling, field geodetic surveys, using archival topographic maps, data of permafrost engineering surveys, satellite high-resolution imagery, etc. Majority of living houses in Eastern Chukotka built before 1990 has deformations, following numerous cracks in walls and floors. Frequent fresh water leakages form swampy areas, which often leads to thermoerosional ravines formation. Study revealed existence of technogenic taliks under old living houses. Built-up areas of studied settlements have changed permafrost conditions that can be dangerous for further exploitation and development. As the general population depends on the production of marine mammals, the communities of Chukchi Peninsula are experiencing sea impact to a different degree, because they confined to the shores of the Bering and Chukchi seas. The information about most of settlements in the region known since XVI-XVIII centuries that allows indirectly judge about relative stability of coast sections, on which they are located. However, the comprehensive analysis has revealed the fact of retreat in recent years coastal sections located within some communities. Some engineering facilities, situated near the sea either has been destroyed or under threat of destruction. Considered problem may have more acute way in the future. Thus, forecast of cryogenic processes development and key recommendations for mitigation and adaptation to changing permafrost conditions has been made.



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**Gas-emission crater in Central Yamal: relief dynamics based on satellite images analysis**

*A.I. KIZYAKOV, A.V. SONYUSHKIN, M.O. LEIBMAN, M.V. ZIMIN, A.V. KHOMUTOV (Russian Federation)*

New permafrost feature - a gas-emission crater in central part of Yamal Peninsula was in focus of this investigation. Characteristics of the relief within the area of crater formation were obtained based on the analysis of remote sensing data, including very high resolution stereo-pair data as well as field observations. Landsat 8 and SPOT 5 satellite images for various time spans were interpreted to determine the time of crater formation. Time interval of the crater formation was defined as late fall 2013. To determine the relief morphology of the study area before and after the crater formation, digital elevation models (DEM) were derived from two stereo-pairs of WorldView-1 satellite images with the crater. Images and DEM of 2013 documented the existence of the bulge with base diameter 45-58 m and a height of about 5-6 m in the place of the crater. An analysis of multi-temporal DEM allowed calculating the volume of the crater inside and the parapet formed around it. The volume of discharged material is almost 6 times the volume of material in the parapet. The difference is due to a significant amount of ice that according to the results of field observations is exposed in the walls of the crater. The rate of the crater diameter increase due to thawing of its ice walls was determined as well as the rate of its filling with water over the summer period.



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**Climate Change, Permafrost Degradation and River Hydrology**

*Dmitry STRELETSKIY, Nikita TANANAEV (United States of America)*

Permafrost plays an important role in the balance of greenhouse gases, functioning of Arctic ecosystems and hydrology of the northern regions. To determine the role of permafrost degradation on river flow of small and medium sized watersheds, the extensive fieldwork and analytical procedures were implemented in the transition zone of continuous to discontinuous permafrost near Igarka town located 120 km north of the Arctic circle on the right bank of Yenisei River. Stable isotope composition of rain, snow, and various types of ground ice was used to determine various inputs and runoff pathways to a river flow in several watersheds. Increase in air temperature and thicker snow resulted in permafrost degradation and decrease in the seasonal frost from 1980s which is evident from soil temperature measurements, permafrost and active-layer monitoring and analysis of the remote sensing imagery. Our study found that water flow of smallest creeks is following precipitation closely, while flow of larger river is affected by evaporation effects related to water storage in thermokarst lakes. Direct evidences of the melting ground ice input to a river flow were not found. However, progressive decrease in the seasonal freezing and lower permafrost table allows more groundwater storage and its enhanced coupling to a channelized flow during the winter period. Major influence of permafrost degradation on stream hydrology is thus not through ground ice melting but through changes in the properties of soil profile allowing for enhanced water delivery to the rivers.



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# Dynamics of permafrost conditions in the largest cities of Russian Arctic under climate change and technogenic impacts

*V.I. GREBENETS, F. D. ANDRYUSHCHENKO, E. A. OSTROUMOVA, A.G. KERIMOV, D.A. STRELETSKIY, G.-T. BJORNSSON (Russian Federation)*

Economic development of Russian Northern Regions on permafrost resulted in a new pattern of geocryological conditions, different from natural environment. This pattern is characterized by drastic landscape transformations; changes of heat and mass transfer in the permafrost/atmosphere system; and by engineering and technical pressure upon the permafrost, leading to alteration of its physical, thermal and mechanical properties. In the northern cities this causes increase of ground temperature and intensification of hazardous cryogenic processes in areas under engineering development, reducing stability of geotechnical environment. For example, facility deformations in Norilsk in the last 15 years, became much more abundant than these revealed throughout the previous 50 years. Peculiar natural-technogenic geocryological complexes (NTGC) are formed in the urban centers, which are remarkable by the vector of permafrost evolution, by the set of cryogenic processes, by temperature trends and the other characteristics. NTGC types depend on initial natural settings and on kinds, intensity and duration of technogenic pressure. Our field surveys of permafrost and geological conditions resulted in mapping of 17 NTGC types in Norilsk, 11 types in Yamburg gas field, and 32 types along gas and oil pipelines in the north of Western Siberia. The research presents the results of field observations and temperature modeling of foundations for the largest cities of the cryolithozone under global warming and technogenesis impact. This shows that despite of permafrost conditions deterioration in the most Arctic regions due to technogenic pressure and climate warming, implementation of adequate engineering solutions allows stabilization of permafrost thermal regime.



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**Climate vs. human induced impact on the cryosphere in the Ak-Shyirak massif (Inner Tien Shan)**

*Dmitry PETRAKOV, Alena SHPUNTOVA, Alexandr ALEINIKOV, Markus STOFFEL, Ryskul USUBALIEV*
*(Russian Federation)*

The observed increase in summer temperatures and the related and accelerated glacier downwasting has led to a noticeable decrease of ice water resources in Central Asia, with possible future impacts on the economy of all countries in the region. Glaciers in the Ak-Shyirak massif, located in the Inner Tien Shan, have been described to be-quasi stationary during the mid-20th century, they started to retreat sometimes in the 1970s. Glaciers here are not only affected by climate change, but also impacted by the open pit gold mining of the Kumtor Gold Company (KGC), this is why the role of KGC in the downwasting of Ak-Shyirak glaciers has repeatedly been subject of speculations. The goals of our study therefore include (i) an assessment of Ak-Shyirak glacier covered area and volume in 2013 and its change with respect to 2003, (ii) better identification of triggers of change by distinguishing KGC vs. climate impacts. To estimate change of glacier extent in 2003-2013, we manually delineated glacier outlines using Terra ASTER image from 2003 and SPOT-5 from 2013. For volumetric assessment we used area scaling and GlabTop modeling based on instrumental data. We determined that glacier area losses in 2003-2013 were ca. 21,9 km2 or 5,9% with respect to the values obtained for 2003. Direct impact of KGC on Davydov Glacier in 2003-2013 has led to losses of less than 2 km2, ice removed from Davydov Glacier was covered by rock heaps and transformed into human-made active rock glacier. Using statistical analysis of two glaciologically verified samplings, we demonstrate an absence of the relation between glacier area losses and the distance between the glacier and area of KGC's main activity. Thus we argue that the indirect impact of KGC activities on glaciers in the Ak-Shyirak massif is negligible or even absent. We conclude that the regional climate change is the main driver of glacier shrinkage in the Ak-Shyirak massif which has been almost two times larger in 2003-2013 as compared to 1977-2003.



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**Methane in the ground ice as a proxy of evolution of permafrost in the West Siberia**

*I.D. STRELETSKAYA, A.A. VASILIEV, G.E.OBLOGOV, V. A FEDIN ((Russian Federation))*

Methane is an important greenhouse gas playing a major role in dynamics of climate system. This study focused on methane concentration and genesis in various types of ground ice and permafrost sediments of the West Siberian Arctic. The isotopic composition and volume of methane is indicative of conditions under which ground ice and permafrost was forming and is used in paleoclimatic reconstructions. The data on quantity and genesis of methane was collected from various types of ground ice, such as from Holocene and Pleistocene syngenetic ice wedges, and from the large massive tabular ice bodies more than 25 m thick. Isotopic composition of methane in gas bubbles of syngenetic ice wedges formed in Holocene and the ones formed in Pleistocene confirms atmospheric genesis with concentrations below 0.8 pm. Methane entrapped in tabular ice bodies has bacterial genesis and show considerably higher concentration up to 23pm. Anaerobic environment characteristic of tabular ground ice formation and high organic content of solution provided favorable conditions for methane producing bacteria. Methane production in the sediments below the lake taliks followed by differential freezing of the sediments leads to capping of methane. Warmer climatic conditions and thicker snow cover have resulted in permafrost degradation and decrease of ability of frozen sediments to hold accumulated methane which may result in explosions and formation of deep craters in regions on permafrost. This suggests that events of methane release from permafrost will increase in the future making it an important consideration for economic development of West Siberia region.



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## The Age Of Cryogenic Microrelief In Subarctic Mountains

*Fedor ROMANENKO, Katerina GARANKINA (Russian Federation)*

The age of cryogenic microforms covering the surface of the Subarctic mountains has yet been discussed and a little is known of its evolution. However subarctic mountainous landscapes are very sensitive even to slightest changes in the environment, and the smallest landforms those appear due to alternate freezing and thawing of the soppy ground are the first to receive the impact. Based on the vast amount of field data gathered in 2011-2013 at the Khibiny Mountains, Kola Peninsula, and the Subpolar Urals 10 radiocarbon dates were obtained for different elements of cryogenic microforms. At the Urals turf rampart of the medallion is around 14C 450 yrs and sod buried under the ledge of solifluction terrace is around 14C 150 yrs. The age of peat interlayer at the base of terraces (Khibiny) is 14C 3300-3400 and 800-900 yrs. Buried sods under its ramparts are younger – from 14C 1000-1600 to 300 yrs correspondingly. Consequently solifluction rates are considered 1.4-2.2 mm/yr. The appearance of those biogenic elements marks the transition from one stage of microrelief evolution to another. Resting upon the radiocarbon data and space-time analysis the duration of each stage varies from first decades up to several hundreds of years while the age of a particular form can reach up to the first thousands of years. The stages continuously replace each other in time, or evolve, during the Late Holocene as for the temporary climate warming or cooling (e.g. Little Ice Age). The age differences of microforms at various heights reflect uneven local and regional palaeogeographic conditions of mountainous massifs and could be used as an indicator of the environmental changes. The study is supported by RSF (project № 14-37-00038).



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# Coastal dynamics at the Pechora and Kara Seas in changing climatic conditions and under a human-induced disturbances

*N.G. BELOVA, S.A. OGORODOV, V.V. ARKHIPOV, A.V. BARANSKAYA, A.P. VERGUN, A.M. KAMALOV, O.V. KOKIN, D.E. KUZNETSOV, N.N. SHABANOVA (Russian Federation)*

Examples of the negative impact of the oil and gas development on the resistance of the coasts to erosion are analyzed for the coasts of the Pechora and Kara seas. Local technogenic disturbances in the cryolithozone put the activating mechanism of thermal abrasion into action. Under the conditions of global warming and ice cover decrease, this effect is enhanced due to the increase of the length of the ice free period and the length of the wave fetch. As a result, anthropogenic impact and climate change create a synergetic effect, due to which rates of coastal retreat may double or even triple. Such negative experience has been observed on the coasts of Varandey island, Pechora Sea, and hasn't been taken into consideration during the latest works on oil and gas infrastructure construction on the coasts of the Kara Sea, which also lead to dramatic abrasion rates increase in the region. The task of the present study was to assess the technogenic impact and separate it from the natural consequences of the climate change in coastal areas of the Kara sea. For several key areas on the western coast of Yamal Peninsula, rates of retreat were assessed using multiannual repeated stationary observations data. Additionally, multitemporal satellite imagery analysis for Western and Eastern Yamal allowed to enlarge the period of analysis, as well as to compare the rates and mechanisms of coastal dynamics change for Eastern and Western Yamal.



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# Lacustrine thermokarst dynamics analysis based on remotely sensed data and methods of mathematical morphology of landscape

*V.N. KAPRALOVA (Russian Federation)*

The goal of the study was to investigate how the morphological structures, related to the lake thermokarst, are structured and evolved. That was done with the use of the satellite imagery. Some studies were dedicated to the analysis of the lacustrine thermokarst dynamics based on the remotely sensed data. They employed multitemporal image classification and change detection in order to reveal how the lake areas change and to classify those, as well as to forecast the further evolution of the lacustrine plains. The results provide valuable information on the lake sizes and density. However, the results of these studies reveal discrepancy in forecasting the dynamics of the lake water surface, depending on the permafrost type. At the same time, most of the previous studies aimed investigating the differences in the measured lake parameters across the different study sites and how they related to the geological, permafrost, and climatic environment. Only some of these studies considered the modeling of the general patterns of the thermokarst evolution, which are not dependent on the local natural conditions. This paper presents the study dedicated to the analysis of different quantitative parameters of the lacustrine thermokarst morphological structures. We used the method of the mathematical morphology of landscape to analyze the spatial patterns and dynamics of the thermokarst lakes. The mathematical morphology of landscape approach allows a quantitative analysis of the spatial patterns, formed by the land cover. We used the multitemporal satellite imagery of a high and very high resolution (5-30 m) as the input data. We selected about twenty study sited all across the circumpolar region so they would represent the areas with different geomorphological, permafrost, and physiographic conditions.



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**Ice mass balance of Bellingshausen Dome in 2007–2012 and 2014-2015, King George (Waterloo) Island, South Shetland Islands, Antarctica**

*Bulat MAVLYUDOV (Russian Federation)*

Mass balance researches on Bellingshausen Ice Dome (King George Island, Southern Shetland Islands archipelago, Antarctica) were spent during six summer seasons in 2007–1012 and 2014-2015 and one winter in 2011. The analysis has shown next received data of ice mass balance on Bellingshausen Ice Dome: in 2007/08 – -9,4 cm we, 2008/09 – -72,4 cm we, in 2009/10 – 34,7 cm we, in 2010/11 – 9,9 cm we, in 2011/12 – -42,9 cm we. In 2012/13, 2013/14 and in 2014/15 ice mass balance was also positive. ELA in 2007/08 and 2008/09 was situated a little below top of the Ice Dome (about 225 m a.s.l.), in 2009/10, 2012/13 and in 2013/14 ELA has lowered practically up to sea level, in 2010/11 it was equal 180 m a.s.l., in 2011/12 – 220 m a.s.l., in 2014/2015 – 100 m a.s.l. Good correlation between snow and ice melting and mean summer air temperature for 4 months (December-March) give possibility to renew ice melting conditions for all period of observations at Bellingshausen weather station (from 1969). Ice mass balance for Bellingshausen Ice Dome was also renewed for similar period. Analysis of received data allow to suppose that tendency of climate cooling in this area is outlined in last years.



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IGU2015 – 1222

**Studies of seasonal freezing of grounds in Western Moscow Region**

*Afanasy GUBANOV, M. BRAYLOVSKIY, N. ZADOROZHNAYA, Yu. KONOVALOV, A. LAZAREV, V. NORKOV, A. TOPOLEVA, F. YUROV, D. HASHCHEVSKAYA, A. MASLAKOV, V. GREBENETS, F. ANDRYUSHCHENKO, D. SHMELEV, V. NAZAROV, R. SHINKARENKO (Russian Federation)*

Seasonal freezing is spread all over the territory of Western Moscow Region but it exhibits various intensity, spatial non-uniformity and considerable variability from year to year. The spatial regularities of seasonal freezing formation are to a different degree connected with the climate, the lithology, the conditions of the heat exchange through the surface and landscape structure as well as the degree of anthropogenic disturbance. Decadal field observations (2004-2015 with gaps) including thermal measurements conducted in last few years, revealed that the seasonally frozen layer of Central Russia was mainly influenced by the microclimatic and ground conditions. The research allowed us to establish the correlation of the freezing depth and of the cryogenic structures with the snow cover structure and with meteorological characteristics. The studies showed that the actual depth of the seasonally frozen layer ranged from 0 cm to 1.2 m and depended on the complex of climatological and lithological factors even in the abnormally cold winter period of 2005-2006. The foundation of low-load (lightweight) buildings and structures that is laid at the indicated depth does not ensure their stability in frost-susceptible grounds because irregular deformations of the buildings may occur not only due to the direct but also due to the tangent forces of cryogenic heaving. The evaluation of the dynamics of the seasonally frozen layer makes it also possible to predict the spring flood.



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IGU2015 – 1945

## The identifying of dangerous areas of corrosion of gas pipelines in permafrost regions

*M.A. VELIKOTSKIJ (Russian Federation)*

The lifetime of the most gas pipelines in the North of Russia exceeds 20-30 years or more. At the beginning of the operational period the accidents on gas pipelines in regions on permafrost occurred mainly due to mechanical and thermal reasons, provoked by permafrost: buckling of supports, heaving of pipelines, horizontal displacements due to solifluction, thermokarst subsidence of valve stations and others. Presently, 41% of all accidents in permafrost happen due to the corrosion factor and the main task of the preservation of pipeline systems is to identify potentially dangerous areas (PDA) with the highest corrosion damage of pipelines. Corrosion of metals is very dangerous process because of its unpredictability. The rate of corrosion of pipelines varies from 0.01 - 0.4 to 1 mm / year and more. As a result of numerous years of research the corrosion of metal pipes with the large diameter, located in the landscapes on permafrost (such as tundra, forest tundra and northern taiga) and operated for over 30 years, the author has found that the spatial development of corrosion is closely related to soil aeration conditions in the landscapes. The main indicator of soil aeration is the redox potential (RP) (Eh). Previous studies showed the rate of corrosion was associated with the maximum absolute values of RP. The author has found that the maximum depth of corrosive caverns found in landscapes with the greatest difference between the minimum and the maximum value of RP (ΔEh).Highest standard deviation values of RP (ΔEh) are associated with the maximum currents of pairs of differential aeration in the soil, inducing the corrosive electrochemical processes.



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**Engineering safety of buildings, structures and objects of infrastructure to climate change in the Arctic (on the example of the Norilsk industrial area)**

*Aligyushad KERIMOV, Valery GREBENETS (Russian Federation)*

The results of natural observations as well as calculations and theoretical investigations of the state of big constructions undergone deformations because of geocryological and geoecological situation disturbances are presented. During the last decade, the problem of stability of buildings and constructions in permafrost zone has been significantly aggravated. The complex research in order to establish the reasons of decreasing of bearing capacity of perennially frozen bases have been carried out. In has been found that main reasons of deformations are negative technogenic effect on the geocryological and geoecological environment while the global climate warming still does not effect on the bearing capacity of frozen bases. Main reasons: thawing frozen ground; frosty destruction of concrete structures; the imperfection of normative and regulating documents and system of geotechnical monitoring; the lack of scientific support of complex geotechnical projects. Danger: the possible collapse of objects; the demolition of the deformed objects; the failure of communications and linear objects, including bridges. Solution: promotion of research centers focusing on the study of permafrost engineering problems; Development of normative documents in the sphere of construction and operation of facilities in permafrost areas on the basis of experience; The introduction of the special expertise of projects, implemented on the northern territories for geotechnical engineering safety and efficiency; Improvement of the methods of geotechnical monitoring objects, and frozen ground using non-destructive testing and geophysical research; Selection of modern innovative decisions optimal for northern regions-durable materials, composite pipes for heat supply systems and sewerage systems (sustainable in emergencies), how to repair and restore damaged facilities, adapting the design of buildings and structures are resistant to climate change.



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## Permafrost dynamics and Global Climate Change

*Nella SHPOLYANSKAYA (Russian Federation)*

Climate and permafrost are two natural phenomena making the basis for many features of nature in the Arctic Regions. Fluctuating nature of climate lapse conditioned repeated changes in cryolithozone condition. The most noticeable climate changes occur in relation with periods of approximately 40-45 thousand years. During latter period short temperature fluctuations were traced. From the end of XIX century, a new warming began which is complicated with smaller in range and duration (approximately 30 years) waves. Cryolithozone response to climate change relates to penetration of atmospheric temperature fluctuations into rocks and further change of cryolithozone temperature pattern. Such penetration happens with time lag which increases with depth and directly correlates to the period duration and fluctuation range. Current changes in permafrost are conditioned by short-period climate variations, which do not penetrate deep into subsoil rocks and affect the first tens of meters only. The forecast for ground temperature variation resulted from short-period temperature fluctuations demonstrate that temperature of upper soil layers follows atmospheric temperature variations rising and dropping together year by. In some degree correlation with short-period fluctuations is revealed. Directional soil temperature increase that should have been observed under human-caused warming is not traced. The simulation to asses permafrost behavior during long-term human-caused warming for four warming scenarios – by 1, 2, 3 and 4°! (for the Novaya Zemlaya) demonstrate that establishing of new stationary ground temperature and new permafrost thickness require within at least 20 thousand years. The permafrost as a natural system generally insensitive to alteration and therefore is quite resistant to climate changes.



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IGU2015 – 3634

**Interregional technical cooperation project Project (2014-2017)**

*Bulat MAVLYUDOV (Russian Federation)*

The IAEA project "Assessing the Impact of Climate Change and its Effects on Soil and Water Resources in Polar and Mountainous Regions" INT/5/153 aims to improve the understanding of the impact of climate change on fragile polar and mountainous periglacial ecosystems at the local and global scale for their better management and conservation. The project involves scientists from twenty-three countries (Argentina, Austria, Belgium, Bolivia, Brazil, Canada, Chile, China, Finland, Germany, Japan, Kyrgyzstan, Norway, Peru, Russian Federation, Spain, Sweden, Switzerland, Tajikistan, Tanzania, United Kingdom, United States of America and Uruguay) representing thirteen benchmark research sites in different parts of the world designed to assess the impact of climate change on land-water-ecosystem quality in polar and mountainous regions, and six international organizations (FAO/IAEA, IAEA, UNU, UNEP, EC and ICIMOD). Scientists of different backgrounds, such as glaciology, soil science, geography, environmental science, water management, marine geology, biology, paleogeography and isotopic science participate in this project. These scientists will work together. The project consists of two major geographical directions: 1) international research on the isotopic properties of the ecosystems in the polar regions (King George Island, Western Antarctica, Spitsbergen and Greenland), including investigations on glacier, moraines, ash layers, lake sediments, permafrost, soil, sea sediments, biota spreading. Each discipline provide specific information, complementing each other, and combined giving common and reliable picture of glacier retreat and its consequences in study area. 2) similar regional research in different mountain areas and directly connected with research in polar regions where processes are more active and clearly visible.



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# Free Economic Zone Phenomenon: Theoretical Analysis and Case Studies

## Free Economic Zone Phenomenon: Theoretical Analysis and Case Studies 1

**Chairperson(s):** *Guangwen MENG, Hans GEBHARDT*

- Free Economic Zones and Development on the Mexico –Belize Border Region

  *Francisco LLERA, Angeles LOPEZ-NORES (Mexico)*

- Free Economic Zones and Uneven Geographical Development

  *Ferenc GYURIS (Hungary)*

- Globalization And Financial Integration And Technology Between Countries Emerging: The Fostering Bank Of Brics (Brazil, Russia, India, China And South Africa)

  *Hindenburgo Francisco PIRES (Brazil)*

## Free Economic Zone Phenomenon: Theoretical Analysis and Case Studies 2

**Chairperson(s):** *Guangwen MENG, Hans GEBHARDT*

- North Korean Special Economic Zones along the DMZ-Border: More than a relict of ambitious political strategies?

  *Bernhard KOEPPEN (Luxembourg)*

- Towards a Zoning State? Global Imagined Economy and Post-developmental Zoning Technologies

  *Jinn-yuh HSU (Taiwan (China))*

- Transforming Cross-Border Trade into Cross-Border Economic Zones

  *Florian A. ALBURO (Philippines)*



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**Free Economic Zones and Development on the Mexico –Belize Border Region**

Francisco LLERA, Angeles LOPEZ-NORES (Mexico)

This research work discusses how the establishment of the Corozal Free Economic Zone (CoFEz) has impacted the Chetumal (Mexico) – Corozal (Belize) border region. First, we study how in Chetumal the CoFEz has neither improved the social and economic conditions of the local inhabitants nor has increased Cross border Collaboration. Second, we study the economic and social benefits that CoFEz has created for the local inhabitants on the Belizian side, but they still remain undeveloped at the local level. Finally, this research study explains the economic opportunities that both Chetumal and Corozal could obtain from the CoFEz if they encourage a formal strategy for Cross border Collaboration.



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**Free Economic Zones and Uneven Geographical Development**

Ferenc GYURIS (Hungary)

Our theoretically focused paper is aimed at interpreting the emergence of Free Economic Zones along the notion of uneven geographical development, a concept mainly linked to the name of David Harvey and his attempts to identify spatial strategies capitalist systems adopt in order to sustain economic growth and postpone economic crises. First, we investigate how Free Economic Zones in the global peripheries and semi-peripheries have contributed as spatio-temporal fixes to maintaining economic growth in centers of the global economy. Second, since our so-far analyses revealed the existence and extensive utilization of similar strategies in Communist or "real existing socialist" regimes, we study how Free Economic Zones in Communist countries can also be interpreted as spatio-temporal fixes for these systems themselves. Finally, we analyze whether Free Economic Zones in Communist countries have managed to contribute to economic growth and the reproduction of the economic and political system in both the capitalist world (where investors have been coming from) and Communist countries (where investments have flown to), or have rather promoted the expansion of the one system and the withdrawal of the other one.



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**Globalization And Financial Integration And Technology Between Countries Emerging: The Fostering Bank Of Brics (Brazil, Russia, India, China And South Africa)**

Hindenburgo Francisco PIRES (Brazil)

This research analyzes how the financial deregulation and the bankruptcy of the credit system of the central economies (United States of America, United Kingdom, Japan and the European Union) are influencing the processes of integration and recomposition financial and technological of the countries emerging from the bank fostering the development of the BRICS (Brazil, Russia, India, China and South Africa). The objective is to show that actions against the hegemonic neoliberal financial model to the current deregulated such as, for example: the creation of the bank of BRICS, the construction of infrastructure of pipelines and the construction of parallel networks to the Internet controlled by the United States, may trigger a geopolitical rearrangement the current model of globalized accumulation of international finance capital. To carry out this of this research were raised and collected statistical and economic and financial data in the following research institutions: World Bank (World Bank), International Monetary Fund (IMF), U.S. Treasury (U.S. Treasury), Division of Research and Monetary Statistics Business and the Federal Reserve US Federal (Reserve Board, Divisions of Research & Statistics and Monetary Affairs), European Statistics (Eurostats), Organisation for Economic Cooperation and Development (OECD), Stockholm International Peace Research Institute (SIPRI) and Institute of Applied Economic Research (IPEA). The goal of this work is to contribute to a set of reflections and questions for the debate on the financial crisis, the US debt and the central economies are compelling emerging countries to seek: (a) new forms of regional integration; (b) economic arrangements, commercial, technological and financial; (c) sustainable alternatives that minimize social inequalities exacerbated by the economic neoliberalism globalization policies. Keywords: Globalization, Financial Deregulation, Social Inequality, Bank of BRICS.



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# North Korean Special Economic Zones along the DMZ-Border: More than a relict of ambitious political strategies?

Bernhard KOEPPEN (Luxembourg)

The Demilitarised Zone between the Republic of Korea and the Democratic People's Republic of Korea is judged to be the last border of the Cold War. Although no peace treaty has been signed after the Korean War, astounding changes in the South-North relations could be observed between the late 1990s and 2010. Although severe provocations of the North finally led to a new stop of a further rapprochement, the unexpected reconciliation process started in 2000 by South Korea not only led to a temporary detente, but also showed spatially manifested results. Two Special Economic Zones, one dedicated to tourism and the other to industrial production, had been established in the DPRK near the DMZ. Whilst the tourist resort had been closed since then, the industrial zone continues almost continuously working, despite cold and hot conflicts between the North and the South. What is the appropriate interpretation of those diffident activities which lasted for almost a decade? Were these SEZs really first successful attempts at feasible Korean cross-border cooperation or just "cash cows" for the one and part of the branch plant economy and extended workbank for the other? Summing up all knowledge on North-Korean SEZ policy and the general state doctrine, it seems that "serious" cross-border cooperation is not – and has never been - an option for the DPRK's current leadership. These attempts occur more to be another part of the political mosaic of economic crisis and brinkmanship of the DPRK.



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**Towards a Zoning State? Global Imagined Economy and Post-developmental Zoning Technologies**

Jinn-yuh HSU (Taiwan (China)

This research examines the spatial and political rationalities and practices behind the special zone policies, such as free trade zone, employed by the state to produce selectively liberalized areas. It argues that the function of zoning is to harmonize laws and standards, in the sense of reducing or eliminating regulatory differences, in order to create commensurable spaces ensuring `freer' trade in the special zones. The zoning project is better understood as a dual process of territorialization. On the hand, zoning technologies make commensurable spaces imaginable at a territorial, from subnational to supranational, scale within a global economic spaces of flow. On the other hand, the mobilities imagined or desired by zoning projects are highly specific and can be materialized for people, things and activities that are known and calculable within bounded spaces and make the local-to-global relationship possible. The consequence of the dual process is not the materialization of the frictionless global flows of neoliberal imagination, but rather a complex interaction between methods of calculation and the discursive framing of particular objects as barriers to flow by the nation states. Through the zoning technologies, the states de-territorialize and re-territorialize in the global imagined economy.



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**Transforming Cross-Border Trade into Cross-Border Economic Zones**

Florian A. ALBURO (Philippines)

One of the original rationales for promoting, and expanding export processing zones (EPZ) among developing countries was creating a geographically confined location for manufacturing firms (principally but not exclusively multinationals) engaged in international trade through production with components from other sources (countries). In most cases, developing countries supply labor inputs in global production. And the context for the EPZ was a dualistic economy shielding domestic markets but also supporting liberal trade. With the continuous trade liberalization, the rationale for exclusive areas for manufactured exports has diminished. Countries now tend to be fully integrated with global production. For other countries however especially land-locked or those with common borders with others and for which globalization has not broadly reached, there is the question how to join the international trading system. This paper argues that for those countries with cross-border trade, economic zones remain an important option. It may not be like the EPZ before but nevertheless physical configurations may be similar. Part of the reason for a cross-border EPZ at least for some borders is due to their historical evolution having started out with informal cross-border trade. As globalization takes foothold through dismantling of zone boundaries in country core parts (e.g. those built around the ports), border towns and territories are often left out. With modernization and better transport infrastructure they tend to be by-passed. The economic task then is to encompass border areas and formalize what had been informal trade. This would be deliberate development through inclusive transport corridors and eventual economic corridors. The paper documents this evolution of cross-border trade; identify criteria by which a cross-border economic zone (CBEZ) would make sense; determine how this will capture global value chains; and demonstrate directions through illustrative countries.



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# Geography Methods for Preservation of Heritage

**Chairperson(s):** *Yury VEDENIN, Juri MAZUROV*

- Decrease in the function of thermal buffer attributable to tree cutting at Angkor monuments
  *Tetsuya WARAGAI (Japan)*
- Evaluating the Preservation Area Boundary of a World Culture Landscape Heritage in China
  *Shangyi ZHOU, Honglian HUA (China (Beijing))*
- Geography Methods in Heritage Preservation
  *Tamara SEMENOVA, Yury VEDENIN (Russian Federation)*



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**Decrease in the function of thermal buffer attributable to tree cutting at Angkor monuments**

Tetsuya WARAGAI (Japan)

Angkor monuments inscribed to the World Heritage List were mainly built by a masonry construction using sandstone blocks from the 9th to 15th century. The most of the monuments were covered by dense vegetation when it was discovered in 19th century. Then the vegetation on building materials has been cleared with the progress of conservation and protection projects. Tree cutting, however, may accelerate wet-dry fluctuations of the materials and cause high temperature of the monuments. This study carried out the analysis of thermal condition of Angkor Wat, Ta Prohm and Banteay Kdei temples that shows different vegetation cover. Air temperature was measured using forty data loggers on March and September 2014. In addition, surface temperature of the materials was measured by a thermography. Regarding to temperature distribution, it showed a homogeneity before sunrise, the temperature of open space around the buildings was approximately 2°C higher than the area covered with trees. Besides, the surface temperature of sandstone blocks in Angkor Wat (for instance) reached 55°C at 9:00 of the same day under air temperature of 31°C. The surface temperature showed approximately 40°C even at 15:31. Namely, a great thermal gradient arose between the building and the vegetation area. Although the tree cutting has progressed since the 19th century to conserve and protect the monuments, it reduced the function of thermal buffer owing to trees. Ironically, the tree cutting may contribute to the weathering of building materials.



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**Evaluating the Preservation Area Boundary of a World Culture Landscape Heritage in China**

Shangyi ZHOU, Honglian HUA (China (Beijing))

Honghe Hani Rice Terraces (HHRT) in Yunnan Province, China was labeled as World Culture Landscape Heritage by UNESCO in 2013. After that, the local government made a preservation plan for this area. The plan chose some villages in this area as the core preservation area. This paper aims to tell if the plan drew a suitable boundary of the core area. The holistic analysis of a region is the geographical perspective of this paper. This study surveyed the boundaries of human-environment system in study area. We used the density of flows, economic activity network, social network and geographical perception reach to define the boundaries. And then we evaluated them by three criteria, which are sustainable development, social justice and the ability to innovate a new human-environment system at different scale levels. The conclusion is some part of the boundary of preservation area can reach the aims of sustainable development, social justice and innovation of new human-environment system at larger scale region, while other parts broke the boundary of original economical and social networks. The new administrative area of HHRT does not give an equal chance to the locals. Those “inside” have advantages and those “outside” do not enjoy the same advantages.



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## Geography Methods in Heritage Preservation

Tamara SEMENOVA, Yury VEDENIN (Russian Federation)

Heritage preservation as a multidisciplinary field is traditionally divided between cultural and environmental authorities. This pretty conventional affiliation of the cultural and natural heritage sites to two separate agencies still subsists in the national and international (e.g. the UNESCO World Heritage List) institutional structures. However, in recent decades, the most important contribution for advocating integrated approach in the heritage research and preservation has been offered by the geographers. In particular, the Heritage Institute in Moscow has been established on the initiative of academician Dmitry Likhachev in early perestroika years. Specialists of various disciplines led by geographers have developed the heritage conservation strategy based on two interrelated concepts - teachings about the noosphere by Vernadsky and on the ecology of culture by Likhachev. In accordance with these great ideas principally new approaches to strategy of heritage research have been generated: genetic approach, when heritage is regarded as the carrier of historical memory, which determines the reproduction of national or regional cultural identity; ecological one, when respect for heritage is depicted as a prerequisite for sustainable development of the biosphere and society, thus playing a distinctive role in the formation of the "society - environment" system; and spatial method, when heritage is seen as a vital factor in the preservation and promotion of cultural and natural diversity among local residents and specific ethnic communities in the region. If heritage is ignored in the spatial planning and development (during reconstruction of cities or industrial areas, in urban and rural transformation or creation of new public space), this action will lead to the degradation of unique natural environment and destruction of authentic historical and cultural sites and thereby developers will fail to recognize the resources and natural assets as well as socio-cultural potential of local communities. When applied to the territorial (including regional) development, spatial approach commands involvement of local communities into governance on a way to sustainable development, effective environmental management, job creation and employment, raising awareness about the history, nature and culture of the local place and promoting tolerance and social harmony. In this case one can speak of both tangible and intangible heritage preservation in the framework of regional or local cultural landscape. It is the very cultural landscape where object for protection - a complex or an ensemble, or cluster of sites - is vividly exhibited through integrity of all heritage components either of cultural or natural, tangible or intangible origin.



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# Lakes in a changing world

**Chairperson(s):** *Mikhail NAUMENKO, Vladislav RUMIANTZEV*

- An overview of the lake bathymetric models: Russian case study

  *M.A.NAUMENKO (Russian Federation)*

- Development of lake ecosystems under environmental change during Holocene in the North-West Russia

  *Tatyana SAPELKO (Russian Federation)*

- Rise and Decline of the fishery industry in the Aydarkul-Arnasay lake system (Uzbekistan) – effects of reservoir management, irrigation farming and climate change on an unstable ecosystem

  *M. GROLL, R. KULMATOV, N. MULLABAEV, A. BELIKOV , Ch. OPP , D. KULMATOVA (Germany/ Uzbekistan)*

- Dynamics of changes in water quality of largest freshwater lakes in the World

  *A.V. IZMAILOVA, V.A. RUMYANTCEV (Russian Federation)*

## POSTER EXHIBITION

- Hydrological monitoring of water bodies in reserved areas

  *L.E. EFIMOVA, N.L. FROLOVA, E.S. POVALISHNIKOVA, E.V. TERSKAYA (Russian Federation)*

- Les petits lacs des réserves naturelles protégées – "les repères" limnologiques

  *L. EFIMOVA, V. EFIMOV, O. KORABLEVA, D. LOMOBA, E. TERSKAYA, G. VICHNEVSKAYA (Russian Federation)*

- Evolution of reservoirs of the White Sea coast: from sea lagoons to the meromictic lakes

  *E.D. KRASNOVA, N.L. FROLOVA, T.A. BELEVICH, N.A. DEMIDENKO, L.E. EFIMOVA, V.M. GORLENKO, A.V. KHARCHEVA, M.V. MARDASHOVA, S.V. PATSAEVA, A.N. PANTYULIN, T.E. SAMSONOV, A.S. SAVVICHEV, D.A. VORONOV (Russian Federation)*



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**An overview of the lake bathymetric models: Russian case study**

M.A.NAUMENKO (Russian Federation)

Detailed digital maps of lake bottom are used for many purposes included comprehensive resources management plans, environmental impact assessments, limnological and geomorphological investigation. The creation of digital bathymetric models ( DBM) of lakes allows not only store the data on depths and coasting line in a standard format, but also to estimate major morphometric characteristics of the reservoirs. To calculate the water, thermal and chemical budgets of large lakes, it is important to know the distribution of their surface areas and volumes with depth. The development of numerical representations of lake bottom topography is the advanced methods of limnological studies. We will discuss recently produced digital bathymetric models of Russian lakes (Lake Ladoga, Lake Onega and another). The models can utilized to estimate the area and volume of individual morphological forms, plan additional data collection surveys and sampling. Another important application of bathymetric models can be in ecological modeling and remote sensing study of the lake. However for many lakes the similar applications are not realizable yet in connection with lack digital bathymetric models. Therefore the usage of DBM is not fully exhausted thus is a challenge for further investigations.



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# Development of lake ecosystems under environmental change during Holocene in the North-West Russia

Tatyana SAPELKO (Russian Federation)

Paleolimnological studies in North-West Russia have established development patterns of the lakes from their inception to the present. With the help of interdisciplinary research, we found features of ecosystems development without human impacts on the lake, with minimal impact and the obvious influence of man on lake ecosystems. We set the beginning of human impact on lake ecosystems of the northwest Russia. This is mainly due to the beginning of agriculture impact on the lakes catchments in the Late Holocene. Pollen data studying sediments of lakes and archaeological sites located along the shores of lakes, allowed to make such conclusion. The next stage of increasing anthropogenic pressures on ecosystems of lakes connected with the beginning of industrial development. However, natural factors continue to have a profound effect not less than human factors. The new method, developed at the Institute of Limnology RAS in recent years, makes it possible to calculate the percentage of natural and anthropogenic impacts on lake ecosystems.



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**Rise and Decline of the fishery industry in the Aydarkul-Arnasay lake system (Uzbekistan) – effects of reservoir management, irrigation farming and climate change on an unstable ecosystem**

M. GROLL, R. KULMATOV, N. MULLABAEV, A. BELIKOV , Ch. OPP , D. KULMATOVA (Germany/ Uzbekistan)

Originally a shallow saline depression between the Kyzyl Kum and the Nurata mountain range the Aydarkul-Arnasay Lake System (AALS) was created in 1969, when a catastrophic flood event in the Syrdarya catchment exceeded the capacity of the Chardarya Reservoir. Additional water diversions further increased the volume of the lakes to up to 42.2 mln $m^3$ in 2006. After the breakdown of the commercial fishing in the Uzbek part of the Aral Sea in 1983 the AALS became the most important fishery lake in Uzbekistan with an annual catch of more than 4,600 tons (in 1988). In recent years however, the fish catch experienced a sharp decline (down to 728 tons in 2006) due to the increased inflow of drainage water from the large Golodnaya Steppe (Hunger Steppe) irrigation scheme (e.g. 0.1 $km^3$ in 1960, 1.0 $km^3$ in 1970, 2.3 $km^3$ in 1980, 2.9 $km^3$ in 2000 and 3.6 $km^3$ in 2010) and a decrease of freshwater inflow from the Chardarya Reservoir (e.g. 4.0 $km^3$ in 1995, 2.3 $km^3$ in 2005 and 1.8 $km^3$ in 2010). The increasing anthropogenic pressure as well as the impacts of the climate change (+0.6-0.9°C between 1950 and 2000, decrease of the long-term precipitation and increase of the variability) are threatening this ecological and economic important lake system. This article presents new data about the temporal dynamic of the lake hydrology (size, volume, water balance), the surrounding climate and its development as well as about the water quality of the lakes and the main drainage water collectors, and the development of the fish fauna over the last decades. This study, based on official data (Uzhydromet, Uzryba), online data bases (GHCN) and extensive field work (water quality and fish sampling), provides the most complete published analysis of the status quo of the AALS. Therefore it is an important contribution for the establishment of a stable lake ecosystem system and a sustainable fishing industry.



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**Dynamics of changes in water quality of largest freshwater lakes in the World**

A.V. IZMAILOVA, V.A. RUMYANTCEV (Russian Federation)

World's largest lakes are bodies of water with a surface area of more than 1,000 km2. In the world today there are 79 freshwater lakes with an area of 1,000 to 10,000 km2 and 14 with an area of more than 10,000 km2, they are concentrated 4.6% and 70.6% of all fresh lake`s waters of the Earth, respectively. Based on these figures it is clear that the largest lakes are the most important reserve of surface fresh water of the planet, so it is very important to have an understanding of the changes in the quality of this resource. The dynamic of changes in the trophic level of the largest lakes in the world and dynamic of their toxic contamination, as well as changes in total volumes of water of different quality categories for 1950-2010 are considered in this report. Since the bulk of fresh water is concentrated in the deepest lakes, whose resistance to pollution is much higher than that of small ones, the total amount of oligotrophic and slightly contaminated waters in the world remains great, more than 90% of freshwater in largest lakes is of relatively high quality. Water of poor quality is found in many large shallow lakes with very high pressure on the catchments in both the tropical and temperate latitudinal zones. In tropical zone the necessary water conservation measures cannot be implemented due to the low level of economic development of the countries located along the shoreline.



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## Hydrological monitoring of water bodies in reserved areas

L.E. EFIMOVA, N.L. FROLOVA, E.S. POVALISHNIKOVA, E.V. TERSKAYA (Russian Federation)

Water bodies of reserved areas are the important water resources of Russia regions. However, in many reserves there isn't scientifically reasonable monitoring system of their water bodies. It makes difficult complex investigations of their ecological condition under the changing anthropogenic load and possible climate variability. In the framework of our investigations a system of hydrological monitoring has been developed using as an example of the northern area of the "Valdaisky" National Park. A set of indicators and parameters characterizing the hydro-ecological conditions of water bodies has been developed based on the results of field work. The monitoring data were into a database created as a part of the State Water Cadastre. Thematic computer maps and a cadastre of the water bodies have been created for the entire territory using GIS methods and satellite imagery. Some hydrographic features of the lakes of the Valdai lake region have been estimated and compared with the lakes of the Belorussia lake region. Some changes in the structure of the anthropogenic pressure have been studied. The reduction of the agricultural pressure on the catchments has been identified at the backdrop of some substantial increase of the recreational and domestic pressure. The dominant role of the morphometric and landscape factors has been identified based on the analysis of the seasonal variability of the content of biogenic and organic substances and the oxygen regime in the water bodies. Some recommendations on the creation of a monitoring system that would be optimal from the economic and informational point of view have been presented to monitor of the water bodies of the Borovno–Razliv lake–river basin.



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## Les petits lacs des réserves naturelles protégées – "les repères" limnologiques

L. EFIMOVA, V. EFIMOV, O. KORABLEVA, D. LOMOBA, E. TERSKAYA, G. VICHNEVSKAYA (Russian Federation)

Les petits lacs sont les objets très vulnérables à la pression antropique, ils réagissent rapidement aux changements qui se produisent dans leurs bassins versants. Le régime hydrologique et la composition chimique de l'eau des petits lacs dans les réserves naturelles ne subissent pas cette pression, préservant leurs état de fond. C'est pourqois on peut les nommer "les repères", aves lesquels on peut comparer l'état d'autres lacs de la même region, existants dans les conditions similaires. Au cours de nos recherches en 2012-2015 on étudiait les petits lacs situés dans la réserve "Kerzhenskiy" (la vallée de la rivière Kerzhenets - affluent de la Volga). La durée différente de la connexion hydraulique entre le lac et la rivière – l'agent la plus importante de la diversité de la composition chimique dans les lacs de la plaine inondable. La température et l'oxygène dissous, dépendants des caractéristiques morphométriques des fosses lacustres, déterminent eaux- même la productivité dans les lacs. La particularité du régime des lacs des plaines inondables - la saturation de l'oxygène dans l'eau depuis une courte période de la grande crue. La présence des zones déficitaires en oxygène est soutenu par la teneur élevée en substances organiques, provenantes du bassin versant, de la zone de chalandise ou enterrées dans le sol. Les petits lacs de la plaine inondable de la réserve reflètent les différentes séquences de leur évolution. La composition chimique des sédiments du fond des lacs on peut considérer comme l'indicateur important des processus, connus par le lac au cours de l'évolution.



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**Evolution of reservoirs of the White Sea coast: from sea lagoons to the meromictic lakes**

E.D. KRASNOVA, N.L. FROLOVA, T.A. BELEVICH, N.A. DEMIDENKO, L.E. EFIMOVA, V.M. GORLENKO, A.V. KHARCHEVA, M.V. MARDASHOVA, S.V. PATSAEVA, A.N. PANTYULIN, T.E. SAMSONOV, A.S. SAVVICHEV, D.A. VORONOV (Russian Federation)

White Sea coast provides a unique ability for studying of the ecological transformation of coastal lakes by sea transgressions and regressions. In the western part of the White Sea, in particular, in the Coast of Kandalaksha Gulf the shore undergoes a rapid glacioisostatic lifting. In the vicinity of the White Sea Biological Station of Lomonosov Moscow State University (MSU) the speed of the uplift is at a rate of about 40 cm per century. This, together with irregularity of the coastline, abundance of islands, alternation of hollows and thresholds winding coastline and uneven topography provides favorable conditions for separating of the bays from the sea and leads to appearance of many water bodies in various stages of separation. During last years interdisciplinary researches of such reservoirs actively develop. Some faculties of MSU (faculties of biology, geography and physics) and some institutes of academy of Sciences of Russia participate in these field researches. As a result of a few years of investigation invention of the coastal lakes by now we have data on more than 20 water bodies in various stages of isolation from the sea, including seven meromictic lakes, five flow-through lagoons, four inlets with first signs of stratification, as well as seven fresh lakes completely lost their connection with the sea. Water column of meromictic lakes inhabited by unique microorganisms exercising anoxic photosynthesis. Hydrological structure of these lakes, thermal, hydrochemical regime, optical properties, hydrobiological and microbiological features of these reservoirs were studied. Results of long-term complex researches of these unique water objects are presented in this report. This study was supported by the Russian Science Foundation (grant No. 14-37-00038).



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# Land Use and Nature Conservation in Riparian Areas

## Land Use and Nature Conservation in Riparian Areas - The Interrelation Between Efficient Ecosystem Functions and Beneficial Ecosystem Services on Floodplains 1

**Chairperson(s):** *Bernd CYFFKA, Umut HALIK*

- Ecohydrological Processes and Its Implication in Ejina Riparian China

  *Wenzhi ZHAO (China (Beijing))*

- Changing of the Oka river floodplain inundation regime as a result of the Ryazan' city linear infrastructure development: multiscenario computer modeling

  *A.M. Alabyan, E.A. Fingert, I.N. Krylenko, V.I. Makarov (Russian Federation)*

- Modelling Evapotranspiration Responses of Riparian Vegetation to Groundwater in the Middle Heihe River Basin, CHINA

  *Hu LIU, Wenzhi ZHAO (China (Beijing))*

## Land Use and Nature Conservation in Riparian Areas - The Interrelation Between Efficient Ecosystem Functions and Beneficial Ecosystem Services on Floodplains 2

**Chairperson(s):** *Bernd CYFFKA, Umut HALIK*

- Investigation Of Sand And Gravel Mining Effects On The Sakarya River, Turkey

  *Mahnaz* GÜMRÜKÇÜOĞLU, *Emrah DOĞAN, Rabia* KÖKLÜ (Turkey)

- The principles of ecological restoration of mountain rivers floodplains

  *V.M. KATOLIKOV, A.E. VESELOV (Russian Federation)*

- Strategies for monitoring of reservoir flushing with a focus on ecological indicators

  *Stefan HAUN, Lydia SEITZ, Martin SCHLETTERER, Sabine U. GERBERSDORF, Martin RIEDL, Johann NEUNER, Giorgo CARMIGNOLA, Gabriele HARB, Laura LIZANO, Silke WIEPRECHT (Germany)*

- Floodplain evolution and social impacts in anastomosing river valley (case study of Avacha river, Kamchatka peninsula, Russia)

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## POSTER EXHIBITION

### Land Use and Nature Conservation in Riparian Areas - The Interrelation Between Efficient Ecosystem Functions and Beneficial Ecosystem Services on Floodplains

- Grain-size effect on the formation of soil geochemical patterns in the mixed forest landscapes of Smolensko-Moscovskaya upland

  *O.A. SAMONOVA, E.N. ASEYEVA (Russian Federation)*

- Morphology and evolution of boundary river of Russia

  *Alexandr ZAVADSKIY, Alexsandra KOBJAKOVA (Russian Federation)*

- Land Use in Post-Soviet Russia: regional Aspects of the Formation and Development

  *Mikhail KAZMIN (Russian Federation)*



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**Ecohydrological Processes and Its Implication in Ejina Riparian-China**

Wenzhi ZHAO (China (Beijing))

The Ejina desert riparian forest is an important component of the lower reaches of Heihe River basin in China. It has significant biological function to the biodiversity conservation of desert region, and has important significance to maintain ecological security of Heihe River basin. In this region, the pattern and composition of riparian forests are considered to be determined by hydrologic processes. But in turn, vegetation pattern of riparian forest can also impact on hydrologic process. We investigated the distribution pattern of oasis vegetation and the alternation of surface and underground hydrologic process in Ejina desert riparian forest. Using RS and GIS technologies, we analysis the interactions between riparian forest and hydrological process, and estimate the ecological water requirement for maintaining desert riparian forest ecosystem stability. Our results showed that the desert riparian forest in Ejina is in a completely degenerated process on patch scale. Moreover, the landscape fragmentation is more obvious at the termination of Heihe River, because of flux decreasing and river shape. Both natural and human factors determine the interaction of changes in hydrological process and vegetation distribution. The distribution pattern of oasis vegetation is in response to both surface and underground hydrologic processes in two directions (parallel and perpendicular to river channel). To maintain landscape stability in desert riparian forest, the draw-off discharge of the Heihe River needs to reach 1.94×108-2.24×108 m3, when considering natural losses and human consumption; and this value would amount to 4.28×108-5.17×108 m3 to make the riparian forest reach the highest productivity. This result provided a useful reference for management of water resources in the Heihe River Basin.



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## Changing of the Oka river floodplain inundation regime as a result of the Ryazan' city linear infrastructure development: multiscenario computer modeling

A.M. Alabyan, E.A. Fingert, I.N. Krylenko, V.I. Makarov (Russian Federation)

The Oka river is one of the greatest and most important from the economic viewpoint river of the European Russia. Throughout centuries its floodplain served as a source of agricultural products and place for recreation, hunting and fishery. A number of old Russian cities, such as Orel, Kaluga, Ryazan', Murom, Nizhniy Novgorod are situated along extra-channel areas of the Oka. Medieval settlements usually were been founded on terraces and valley slopes to avoid annual spring flooding. However, the intensive urbanization and industrial development of last century induced spreading of city infrastructure to floodplain lands. Construction of highway embankments crossing the valley or cutting vast floodplain areas from the main channel and blocking minor arms significantly alter usual ways of floodwaters and flow depth. Moreover, during last decades a tendency to situate new inhabited city districts on floodplain areas appeared. The Oka is distinguished by the fact that it is one of unique large rivers draining dense populated and developed region and persisting almost natural hydrological regime. There are no reservoirs on its main channel being able to decline flood runoff, and spring water level sometimes rise up to 8-9 m. The most outstanding flood with maximum discharge 12200 m3/s at Ryazan' took place in April 1970 just before the construction of bridge and highway crossing the floodplain. The 2D hydrodynamic model STREAM_2D based on numerical solution of Saint-Venant equations on hybrid mesh was used for simulations of various scenarios of floodplain development and channel engineering. Calibration and verification of the model was executed by comparison of simulated inundate areas with outlines of flooded zones on satellite images for known hydrologic situations.



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# Modelling Evapotranspiration Responses of Riparian Vegetation to Groundwater in the Middle Heihe River Basin, CHINA

Hu LIU, Wenzhi ZHAO (China (Beijing))

Riparians remaining in the arid inland river landscapes of northwestern China are suffering degradation, and qualitative understanding the dependency of the riparian vegetation on groundwater is important for water resource managers to balance water withdrawals with ecological concerns or public safety. A process-based stochastic soil moisture model developed for groundwater-dependent ecosystems was employed to modelling the interactions between rainfall, water table fluctuations, soil moisture dynamics, and vegetation, and to investigate the evapotranspiration responses of riparian to groundwater system in the middle Heihe River Basin. Field measured groundwater levels, vertical soil moisture profiles, soil water potentials, and root biomass allocation and transpiration of pioneer species were used to calibrate and validate the stochastic model. The parameterized model was then running to simulate the probability distributions of soil moisture and root water uptake, and quantitative descript the vegetation–water table–soil moisture interplay in the hypothesized scenarios of future. Our analysis highlights the important role of groundwater in supporting the riparian vegetation, and nonlinear dependences of ET to groundwater depths varied with geomorphic position.



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**Investigation Of Sand And Gravel Mining Effects On The Sakarya River, Turkey**

Mahnaz GÜMRÜKÇÜOĞLU, Emrah DOĞAN, Rabia KÖKLÜ (Turkey)

Sakarya is an important agricultural and industrial region and Sakarya River irrigates to this fertile land. Its total length is nearly 810 km, rising on the Anatolian plateau, northwest of Turkey. The Sakarya River has mild slopes with its sinuous and meandering shape extending from Black Sea, Karasu Region. Sand and gravel are important materials for construction and generally found in the floodplain and bed of rivers and streams. Sand and gravel have been withdrawn from the Sakarya River channel bed and its floodplain. Sand-gravel mining activities have been continued since many years. Withdrawing of sand-gravel cause significant morphological changes including bank erosion, riverbed degradation and widening. These changes can erode away precious soil adjacent to the river and threaten manmade structures on, near and over the river. The purpose of this study is to present the degradation in the Sakarya River which occurs due to sand and gravel mining. Past and current profiles of riverbed have been compared by using geographic information system (GIS).



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## The principles of ecological restoration of mountain rivers floodplains

V.M. KATOLIKOV, A.E. VESELOV (Russian Federation)

River floodplains play an important role in the river channel formation and in the transport of river sediments, determine the hydraulic conditions for the passage of floods and habitat aquatic and semi-aquatic biota. The fundamental breach of floodplain morphological structure is very often in the course of human applying of river channels and floodplains (transport construction, the construction of dams, gold mining). Restoration of floodplains may has various purposes. At the present time, priorities should be given to environmental and conservation purposes. Principles and methodology of restoration must takes into account the laws of river channel formation and transport of river sediments, biological requirements for the grain composition of bed load, for morphometric parameters and topography of floodplains and their underwater morphological elements (beaches, point bars, shallows and crossings), which form the optimal hydraulic flow regime to habitat and reproduction of biota. In this case, authors have developed principles of restoration of mountain rivers floodplains with all above requirements based on physical (hydraulic) modeling of channel and floodplain of the river Mzymta at the spatial hydraulic eroded models and based on the study of living conditions of aquatic biota in natural conditions of the river Mzymta. Performed experimental studies allowed to classify the mountain river floodplains by their genesis, by their role in the river channel formation and by their ability of self-restoration. This classification of floodplains and channel forms defines the methods of restoration, which together with the developed biological requirements provide a comprehensive methodology for ecological restoration of mountain rivers floodplains after the destructive human impact.



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**Strategies for monitoring of reservoir flushing with a focus on ecological indicators**

Stefan HAUN, Lydia SEITZ, Martin SCHLETTERER, Sabine U. GERBERSDORF, Martin RIEDL, Johann NEUNER, Giorgo CARMIGNOLA, Gabriele HARB, Laura LIZANO, Silke WIEPRECHT (Germany)

Reservoirs are used to store water for multiple purposes (drinking water supply, irrigation purposes, generating hydroelectricity and flood control) and are therefore of great importance for our society. However, annually an amount of 1% of storage volume is lost due to sedimentation. Sediment management strategies cannot fully avoid reservoir sedimentation, but might reduce the loss of storage volume. An often used approach for removing deposited sediments from reservoirs is flushing. Important aspects of a successful conducted flushing are the technical feasibility, economic considerations and the minimization of negative effects on biota downstream. As a consequence threshold values for the downstream occurring suspended sediment concentrations are given for different river types during flushing events. Next to these short-term effects, the downstream region may also be affected by flushing due to colmation of the river bed and clogging of spawning grounds for several months. A sufficient clear water release in the post-flushing phase can possibly reduce this effect. This paper focuses on monitoring strategies to record the downstream conditions as result of the release of sediments from reservoirs. Several monitoring methods, performed during flushing operation, will be reviewed and discussed, such as taking water samples (including different sediment sampler options), using Imhoff-cones, continuously monitoring systems with e.g. optical backscatter sensors as well as biological indicators such as zoobenthos drift. In addition it is necessary to perform monitoring activities before and after the flushing to assess long-term effects on the downstream river bed. Concerning abiotic conditions, freeze-core or freeze-panel sampling reveals possible effects of colmation downstream. Biological indicators such as benthos and / or fish are in particularly suitable for monitoring these effects. In this paper we provide a review on monitoring strategies to observe effects as result of reservoir flushing operations with a special focus on ecological indicators in the downstream ecosystem.



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**Floodplain evolution and social impacts in anastomosing river valley (case study of Avacha river, Kamchatka peninsula, Russia)**

Tatiana MILLIONSHCHIKOVA, Sergey CHALOV (Russian Federation)

Avacha is one of the largest rivers of the Kamchatka Peninsula (Far-East of Russia). During snow-melt flood velocity of flow on the river reach 5 m/sec. This river is piedmont. Average discharge is 135 m3/sec. In this regard, transporting capacity and bank erosion is extremely high. Channel transformations occur with a very high level of frequency that endangers both the natural and ecological components, as well the lives and health of people living in close proximity to the river. In the historical period (XX century) avulsion of the river channel have been significantly influenced regional development. Protection of settlements with total population approx. 46000 people, water intake systems and agricultural lands required measures for floodplain protection. Spatial and temporal changes in floodplain evolution in anastomosing river valley of the river Avacha were analyzed by using satellite images and GIS from 1960 to 2014. We proposed indices of floodplain evolution of anastomosing river named as: -new channel ratio (ratio of the new formed parts of the channel to the full channel area taken from the new survey); -abandoned channel ratio (ratio of the abandoned parts of the channel to the full channel area taken from the old survey); -old channel ratio (ratio of the old formed parts of the channel to the channel area taken from the old survey). Quantitative assessment of floodplain evolution in accordance with hydrological drivers is the main goal of the study which further aims to forecast channel/floodplain evolution under certain climatic conditions and provide a guideline for upgrading bank stability.



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**Grain-size effect on the formation of soil geochemical patterns in the mixed forest landscapes of Smolensko-Moscovskaya upland**

O.A. SAMONOVA, E.N. ASEYEVA (Russian Federation)

Texture is proved to be one of the major factors controlling metal concentrations in soils. However little has been known about the vertical and lateral distribution of the metals in respect to grain-size fractions in soils of catenary or other natural systems, such as gullies. In the present study the concentrations of Fe, Mn, Ti, Zr, Cu, Ni, Co, Cr, Pb are examined in 5 grain-size fractions (1-0,25mm, 0,25-0,05mm, 0,05-0,01mm, 0,01-0,001mm, <0,001mm) and also in the bulk samples taken from the soils in different geochemical positions in the middle Protva basin: podzoluvisols, soddy soils, soddy gleyic soils and soddy soils with buried fluvial soil horizons. The analysis of the upper soil horizons revealed that a wide range of the metals (Mn, Co, Ni, Cr, Zn) were enriched in the clay, while the higher amounts of Fe were found both in the clay and in the coarser sand fraction. The maximum concentrations of Ti were found in the silt fractions, Zr – in the coarse silt fraction. Cu and Pb showed higher concentrations in the medium and fine silt fractions. The compositions of the majority of studied fractions in relation to metal content change during pedogenesis, under the influence of soil and geochemical processes. The enrichment of the sand fractions, fine silt and clay with a wide spectrum of metals occurs mainly in the upper soil horizons. The uniform distribution or the accumulation of the metals in the subsoil is more typical of the coarse and medium silt fraction. The lateral distribution of the grain-size fractions and associated metals in catenary systems implied the importance of the coarse silt and clay fractions in the analysis of the migration processes.



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## Morphology and evolution of boundary river of Russia

Alexandr ZAVADSKIY, Alexsandra KOBJAKOVA (Russian Federation)

Total length of Russia's continental border is more than 22 thousand. Km and about 6 thousand. Km runs along the rivers, which separate Russia from the 14 neighboring countries. The most extensive such sections are located on the border between Russia and Norway, Lithuania, Ukraine, Kazakhstan, Mongolia and China. Often the border rivers are very unstable natural objects exposed to constant reconfiguration, which sometimes contributes to the formation of centers of interstate conflicts. Often this occurs against the background of streamflow and water regime hydrotechnical control of border rivers by one of the countries having a negative impact on the hydrogeological security of the border areas. Thus, the study of the border rivers channel processes is necessary not only for prediction and prevention dangerous forms of their manifestations, but also as the basis for the preservation of good relations between neighboring countries. Distribution of river sections is differentiated within the state border of Russia. For some border areas with the former republics of the USSR river borders are still not demarcated. Border sections varies in the size of the rivers (their water content) and in their length. Russia has 184 river border sections, 40% of them with a length less than 5 km and only 12 sections of the border runs for over 100 km. Located in different natural zones, border rivers form their beds at various combinations of geomorphological, hydrological and landscape conditions that defines the variety of forms of channel processes. As a part of the study was prepared information and map database which helps to inventory and typology border rivers of Russia, made hydrological and morphological analysis. That allows develop scientific approaches for channel processes control to prevent or reduce the economic and political risks.



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**Land Use in Post-Soviet Russia: regional Aspects of the Formation and Development**

Mikhail KAZMIN (Russian Federation)

Land reform which main objectives are reduced to privatization of the land plots, creation of multistructure farms, introduction of availability at a price of land use and development of the land market is carried out in Russia since 1990. As a result 133,0 million hectares of lands were transferred to a private property of citizens and legal entities and that makes 7,8% of land fund of the country. By area, it is consistent with what happened in Russia before the revolution of 1917. 44 million citizens and legal entities became owners of land, mainly in agrarian regions of the European Russia. During land reform process of redistribution of lands first of all affected agricultural grounds on which about 60 thousand farms, 259 thousand country (farmer) farms, more than 16 million personal subsidiary farms, and also a large number of associations of the citizens who are engaged in gardening, truck farming and country economy were formed. The reform process has formed the land market, which received the greatest development in the agricultural regions of European Russia and in suburban areas of major cities in the country. In recent years about 2,8 million bargains with the land plots are annually concluded in Russia, and the area involved in it is equal 50 million hectares that makes about 3% of land fund of the country. During the years of reform the tendency of universal reduction of the area of farmlands and arable grounds at agricultural producers proceeded. The largest scale of reduction characteristic of the densely populated and urbanized areas of southern taiga and forest and steppe zones of European Russia, as well as for the agricultural development of the south of Siberia and the Far East. From 1990 to 2013 the area of agricultural land of farmers decreased by 22,7 million hectares or 10,7%, arable land of farmers decreased by 16,3 million hectares or 12,4%, area under crops of farmers decreased by 41,4 million hectares or 35,2% in the country.



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# Landscapes of Energy

## Landscapes of Energy 1

**Chairperson(s):** *Marina FROLOVA*

- Energetics of natural and antropogenic landscapes
  *Vladimir BOKOV, Viktor SMIRNOV (Russian Federation)*
- Renewable Energy and Landscape Quality
  *Marina FROLOVA (Russian Federation)*
- Thermodynamic landscape characteristics based on remote sensing data
  *R.B. SANDLERSKIY, Yu.G. PUZACHENKO (Russian Federation)*
- Early Brazilian hydroelectric power plants: a Vernadskyian approach
  *Gildo M. SANTOS (Brazil)*

## Landscapes of Energy 2

**Chairperson(s):** *Marina FROLOVA*

- Biomass Energy Production Landscape in the Eastern Part of Croatia
  *Dina STOBER, Zlata DOLACEK-ALDUK, Zeljka JURKOVIC (Croatia)*
- Emerging Wind Power landscapes in the Spanish countryside: Case studies from Andalusia and Castilla y León
  *Marina FROLOVA, Daniel HERRERO-LUQUE (Spain)*
- Overview of wind energy potential in Serbia: case study of Vojvodina region
  *Jelena MILANKOVIĆ, Jasmina ĐORĐEVIĆ, Tin LUKIĆ, Smiljana ĐUKIČIN (Serbia)*



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# Energetics of natural and antropogenic landscapes

Vladimir BOKOV, Viktor SMIRNOV (Russian Federation)

Energetics, as a branch of human activity, for the sustainable development must include all fields of production, transformation and use of energy, including energy landscapes and the biosphere as a whole. To take place gap between the natural energetic and technological energetics. Energy is regarded as a commodity and its relationship with the flow of energy in ecosystems is not analyzed. Technological energetics should fit into the energetic of biosphere to make it whole. Need to preparation natural economy energetic balance (like the water economy balance). Estimated flows of energy and its transformation in the landscapes of the Crimean Peninsula. Replacement steppe landscapes of farmland (in the plains of the Crimea 75% of the area under cultivation) has led to the transformation of structure of radiation, heat and water balance, especially in the area of irrigated agriculture (up to 400 thousand hectares). Has been a manifold increase in the seizure of primary biological production of natural circulation. Replacement forest landscape to shrub, steppe and residential (area occupied by forest decreased over the last century, with 600 thousand hectares to 280 thousand hectares) identified a decrease in radiation balance (residual radiation) by 5-7%, biomass - 10-12%. Accordingly changed the structure of the heat and water balance: decreased cost of heat for evaporation, increased surface runoff. In the settlements and industrial landscapes structure of the energy balance has gained a great transformation. Within them was used artificial incremental energy (mainly thermal and nuclear). Its share in the radiation balance in the settlements and industrial landscapes (which take 3-4% of the territory of Crimea) is 2-5%. This energy comes mainly from outside of the Crimea. Estimated energy efficiency areas of the Peninsula - the ability of the territory to provide economic and social functions of the society of energy produced by different sources. Renewable energy sources significantly exceeds the required amount of energy, but, as is well known, their use is limited to low spatial density and a large variability in time. The analysis shows that the use of renewable energy is best when placed in certain areas, the combination of a number of conditions: microclimatic conditions, degree of shading, the value of the land, its suitability/unsuitability for other activities, the aesthetics of the landscape, the degree of variability of solar and wind flows, the impact on the environment. Was calculated ecological-economic efficiency of solar generators depending on the distance from the gas distribution substations. In the current socio-economic conditions of the solar generators become profitable when removing from the gas distribution substations at a distance of 20-30 km, because at these distances the significant cost of the construction of gas pipelines. When analyzing the energy balance of landscapes and settlements, it is necessary to consider the use of energy due to the regulation of energy flows in buildings. In relation to the amount of energy used for heating buildings control value is approximately 20%. Indirect energy is achieved when the optimal placement of industrial, residential, agricultural objects. As a result of possible savings using the free incremental energy within the first tens of percent of the energy produced.



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## Renewable Energy and Landscape Quality

Marina FROLOVA (Russian Federation)

As a result of climate change, limited fossil energy sources as well as a rising energy demand and rising energy prices, renewable energy production systems are heavily promoted all over Europe. Planning plays a vital role in ensuring the implementation of the energy turnaround away from fossil and nuclear energy sources towards renewable energy sources. With the ambitious renewable energy goals on European, national and regional levels, an effective and efficient rollout of renewable energy production systems is crucial. Yet, the general public support for green energy does often not translate into support for specific projects. Public opposition has become the constraining factor that is decisive for the success of the energy turnaround and landscape change, landscape impacts and perceived loss of landscape quality have featured heavily in the concerns raised by the public. The presentation will report initial findings from an on-going EU COST Action (http://www.cost.eu/COST_Actions/tud/Actions/TU1401) chaired by the presenting author. This 4-year research network project investigates the inter-relationships between renewable energy production and landscape quality, and the role of public participation in planning processes for the acceptance of renewable energy systems. The research network's approach and first results in terms of best practices from a planning science and planning practice perspective will be presented, complemented by empirical research results regarding landscape impact assessment methodologies and the potential of planning to mitigate landscape-energy conflicts.



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**Thermodynamic landscape characteristics based on remote sensing data**

R.B. SANDLERSKIY, Yu.G. PUZACHENKO (Russian Federation)

Method of calculating the thermodynamic variables from remote sensing data allows to estimate the main components of the landscape energy balance: solar energy spended on evapotranspiration and heat flow, based on the concepts of useful work (exergy) and nonequilibrium (information increment and entropy). Spatial and temporal variation analysis of the thermodynamic variables for different terms (season, weather) enables discriminate the "order parameters" – the main factors, or invariants that determine the transformation of solar energy by landscape. Classification of landscape based on main factors makes it possible to identify the classes (units) of landscape thermodynamic system – territorial units with certain characteristics of solar energy transformation. Such classification allows to make the basis for interpolation of landscape functions parameters measured by Eddy Covariance (Flux tower) in the field. Spatial analysis of these units can be the basis for quantitative estimates of the contribution of the landscape in the climate. The report discusses the evaluation of landscape thermodynamic variables derived from multispectral imagery for different scales and areas: - The global level - MODIS TERRA, (5x5o resolution); - Regional level - MODIS TERRA (resolution 500x500 m), the East European Plain; - Local level - Landsat 5, 7, 8 (30x30 m resolution in pixels) for southern taiga landscapes (Central Forest Reserve) and semi-desert landscapes (Kalmykia), tropical seasonally wet forests of Vietnam (Cat Tien National Park).



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**Early Brazilian hydroelectric power plants: a Vernadskyian approach**

Gildo M. SANTOS (Brazil)

Starting in the 1890s the landscape in the southern state of São Paulo was transformed through the construction of hydroelectric power plants. With few exceptions, they used small reservoirs, yet their effect was far-reaching. The introduction of electricity fostered industrial production, urban growth, and contributed to other collateral phenomena such as the coffee plantation success and the implantation of a transportation network, not to mention illumination and a totally new form of leisure, represented by radio and cinema. Interestingly, nowadays a considerable number of those early electrical installations are still operational, some with their original turbines and generators. The population's affective and cultural attachment to the related electric utilities is present, even though recent privatization measures are radically altering such relationships. The plants also retained in their immediate vicinity parts of the original vegetation amid surroundings that in many instances changed drastically, including former rural areas that are now part of the surrounding cities. Another conspicuous feature is today's water quality, which seriously deteriorated the environment. The early power plants were essential for the local, regional and national Brazilian economy to reach its present position, and they remain a living witness of Vladimir Vernadsky's concept of the biosphere evolving into the noosphere by means of scientific thought, and at the same time they indicate the need to improve man's capacity of searching for still higher improvements.



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**Biomass Energy Production Landscape in the Eastern Part of Croatia**

Dina STOBER, Zlata DOLACEK-ALDUK, Zeljka JURKOVIC (Croatia)

Croatia is undergoing a slow transition towards a green industry addressed by an ambitious political agenda that aims to expand renewable energy production systems, more than social and technological predisposition. Plans for renewable energy production are highly sector directed (energy and economy) and focused only on the possible effect of decreasing unemployment due to weak economy and effects of economy crisis in Croatia. While there has been a remarkable quantity and even more important, continuity, in researches of public acceptance of landscape transformation in countries with mature participatory culture, the same issue in Croatia is conducted only bottom up and scattered throughout territory and time period. In the eastern part of Croatia, traditionally agricultural area, significant efforts are directed towards the expansion of biomass and biofuel power plants. Aim of this study is contribution to the pool of findings regarding public perception on landscape transformation toward planned energy landscape. The research focus was to find out the amount which factors influence people's acceptance of the biomass power plants in the eastern Croatia. We measured the acceptance of the sites for biomass and biofuel power plants according to the scale of industry complex appearance as well as different regional landscape context conducting a photo simulation and graphic drawings survey. The questionnaire was distributed to local population, experts and investors and the results of target groups were compared. The results from statistical analysis will be presented and the possibilities for a renewable energy landscape development will be discussed.



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## **Emerging Wind Power landscapes in the Spanish countryside: Case studies from Andalusia and Castilla** y León

Marina FROLOVA, Daniel HERRERO-LUQUE (Spain)

Over the first decade of the 21st century decentralized energy infrastructures have spread quickly through rural areas in Spain. They have transformed its physical landscape. This has raised issues regarding landscape practices and values. These infrastructures have often been a source of tension, triggering the emergence of new attitudes towards landscape. Through the analysis of steakholders views in two local case studies from the Spanish regions of Andalusia and Castilla y León we explore several mismatches between national targets and local realities that reveal through analysis of different steakholders discourses on wind power landscape. In conclusion we show that landscape is both an aesthetic issue in the spatial planning of renewable energies and an object that is deeply embedded into local practices and local identity. Although many researches emphasize that the role of the landscape in the construction of local identities has had a negative influence on the acceptance of wind power projects, our case studies demonstrate that wind turbines in a landscape not only may not be considered a problem for local inhabitants, but can even participate in the construction of a local identity.



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## Overview of wind energy potential in Serbia: case study of Vojvodina region

Jelena MILANKOVIĆ, Jasmina ĐORĐEVIĆ, Tin LUKIĆ, Smiljana ĐUKIČIN (Serbia)

According to estimates of International Energy Agency (IEA), in the period from 2005 to 2025, increase of 40% in primary energy consumption can be expected. This caused a greater application of renewable energy sources. The growth of the renewable energy sector in the world in the first decade of the twenty-first century was rapid. Serbia is a country with high potential and favourable conditions for RES energy production. The utilization of renewable energy will improve the quality of the environment and reduce dependence on imported energy. Wind energy sector was one of the fastest growing renewable energy technologies and plays an important role in the energy sector accross Europe and worldwide. Wind energy in Serbia is partly studied and not enough exploited despite its great potential (assessment of the wind energy share in total share of renewable energy potential is estimated to 0.19 millions toe annually). This fact reflects not so bright present situation in term of its utilization for the necessity of Serbia's energetic sector. Similar trends are specially presented in the Vojvodina Region (North Serbia), where renewable wind energy potential estimated to a 65 k ten/year gives a share of only 0.7 % in total energy production. The aim of this paper is to provide an overview of wind energy potentials of the Vojvodina region, an important economic region of north Serbia with its existing electrical energy status investigated according to the recent developments of wind energy production on a global, regional and local scale for the main purpose of full implementational concept of the energy efficiency and necessity of Serbia's electricity market.



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# Mathematical morphology of landscape and landscape metrics

## Mathematical morphology of landscape and landscape metrics 1

**Chairperson(s):** *Alexey VICTOROV, Timofey ORLOV*

- Mathematical morphology of landscape: results, problems and prospects

  *Alexey VICTOROV (Russian Federation)*

- Simultaneous segmentation and classification of landscape images

  *Daniel Capella ZANOTTA, Jean Marcel de ALMEIDA ESPINOZA, Miguel da GUIA ALBUQUERQUE, et al. (Brazil)*

- Remote sensing based mathematical modeling applied to different theories of thermokarst lake occurrence

  *V.N. KAPRALOVA, A.S. VIKTOROV, T.V. ORLOV, O.N. TRAPEZNIKOVA, M.V. ARKHIPOVA, E.G. PANCHENKO, S.A. SADKOV, A.V. ZVEREV, P.V. BEREZIN (Russian Federation)*

- The basic concepts of the geosystems theory

  *Vladislav SYSUEV (Russian Federation)*

## Mathematical morphology of landscape and landscape metrics 2

**Chairperson(s):** *Alexey VICTOROV, Timofey ORLOV*

- Landscape pattern investigation based on mathematical morphology of landscape approach for the regions with subsidence and suffusion activity

  *Sergey SADKOV (Russian Federation)*

- Effect of landscape spatial pattern on faunal diversity

  *Ksenia MEREKALOVA, Alexander KHOROSHEV, Lyudmila EMELYANOVA (Russian Federation)*

- Mathematical Modeling of Agricultural Landscape Pattern within the Forest Zone of the East European Plain

  *Olga TRAPEZNIKOVA (Russian Federation)*

## Mathematical morphology of landscape and landscape metrics 3

**Chairperson(s):** *Alexey VICTOROV, Timofey ORLOV*

- Multiscale organization of landscape structure

  *Alexander KHOROSHEV (Russian Federation)*



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- The geometry of the landscape space and its evaluation methods through remote sensing data

  *Alexander KRENKE, Yu. PUZACHENKO (Russian Federation)*

- Proposal of the approach to model the ridge-hollow bog spatial structure within the Belamoro-Kuloyskoye plateau area (Arkhangelsk region of Russia)

  *Timofey ORLOV, Sergey SADKOV, M. ARHIPOVA, Evgeny PANCHENKO (Russian Federation)*

- Evaluating micro-scale soil erosion processes through landscape metrics

  *Alexandre Marco da SILVA, Chi Hua HUANG, Wendy FRANCESCONI, Thalika SAINTIL, Jazmin VILLEGAS (Brazil)*

## POSTER EXHIBITION

### Mathematical morphology of landscape and landscape metrics

- The Influence of the Russian Geosystemic Geography in Brazilian Geosystemic Geography: Historical Background and Future Prospects for Landscape Studies

  *Danilo PICCOLI NETO, Archimedes PEREZ FILHO (Brazil)*

- Comparison of spatial features of soil solid-phase transport in two small catchments (in forest-steppe and steppe zones of Russia)

  *T.S. KOSHOVSKII, A.P. ZHIDKIN, A.N. GENNADIEV (Russian Federation)*



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**Mathematical morphology of landscape: results, problems and prospects**

Alexey VICTOROV (Russian Federation)

Up-to-date state of the mathematical morphology of landscape is characterized with a set of mathematical models of the simplest morphological patterns (landscape mosaics), so called canonical models for different genetic types of areas, such as alluvial plains, plains with karst and soil subsidence. Mathematical models being the theoretical kernel of the mathematical morphology of landscape are the general base for a many task decisions. The models are based on the random process theory. The new trends of the mathematical morphology of landscape are the following: 1. Using the mathematical morphology of landscape for dynamic balance analysis in landscape morphological pattern development. 2. Using the mathematical morphology of landscape to natural risk assessment for engineering constructions. 3. Using current landscape metrics for searching dynamic landscape parameters. 4. Landscape metrics optimization. The first trend can be demonstrated on the example of the morphological pattern of alluvial plains. It is proved that this type of area is characterized with a state of dynamic balance and probability distributions of package size are exponential ones with a shift, The example of the second trend is an analytical decision for thermokarst affection probability on energy infrastructure (a pipeline). The decision was empirically tested. The third trend is used for studying a morphological pattern of territories under landslide process. The analysis of the mathematical model proves that this territory reaches the state of dynamic balance. The relationship between parameters of this dynamic balance state and probability distribution of landslide activation time was found.



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**Simultaneous segmentation and classification of landscape images**

Daniel Capella ZANOTTA, Jean Marcel de ALMEIDA ESPINOZA, Miguel da GUIA ALBUQUERQUE, et al.
(Brazil)

With the increased availability of high spatial resolution remote sensing images, many techniques have been proposed aimed to exploit not only the radiometric features, but also the texture and morphology information of targets present in the image data. These techniques are recognized as object-based and usually perform image segmentation as a previous step of classification. If the input segmentation parameters are not fine adjusted, the search for objects frequently leads to undersegmentation or oversegmentation and long processing time. Differently from traditional segmentation techniques, in the proposed methodology under-growing regions having meaningful size can be pre-analyzed not only in order to test merging among them, but also in order to test labeling according to predefined classes. To this end, we propose to use parametric relationships according to the statistical nature of images and classes. In this study we use the t-student test to compare between statistical features of growing regions and predefined features of classes samples. By using this simultaneous methodology, growing regions with high class membership probability can be early associated to one of the predefined classes, avoiding, for example, further mislabeling of undersegmented regions in the classification process. In this study we consider a TM-Landsat-5 subset (350×450 pixels) characterized by forest and deforestation activities in the Brazilian Amazon (path/row 227/67). The image was acquired in July/2011. The region growing segmentation process performed here has two input parameters: similarity level and minimum region size. In the present experiment we chose to use 10 and 5 as similarity level and minimum region size, respectively. We also set p = 0.95 for the t-student confidence level and meaningful size T = 100 pixels. We have taken tree different samples corresponding to classes of forest, deforestation and water. All samples had size higher than the threshold T. In order to access the effectiveness of the proposed methodology, we performed two different experiments: (i) by segmenting the image followed by maximum likelihood classification, and (ii) by employing the proposed classification-based segmentation followed by maximum likelihood classification of remaining non-classified objects. The maximum likelihood classifications were performed with the objects mean in each channel. The common parameters used in both cases were the same, as well as, the samples of the corresponding two classes. The accuracy assessment was conducted by means of global accuracy. The results computed for the traditional object-based classification (segmentation followed by classification) showed a global accuracy of 75%, whereas the global accuracy presented by the proposed methodology was 78%. As expected, the processing time spent by the proposed methodology was lower than the traditional object-based classification. The results of the experiment indicate strength of the proposed methodology. However, experiments with other areas and other kinds of classifiers are needed to state a more consistent conclusion. We can also mention that, depending on the type and resolution of the image, others statistical tests can be considered.



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# Remote sensing based mathematical modeling applied to different theories of thermokarst lake occurrence

V.N. KAPRALOVA, A.S. VIKTOROV, T.V. ORLOV, O.N. TRAPEZNIKOVA, M.V. ARKHIPOVA, E.G. PANCHENKO, S.A. SADKOV, A.V. ZVEREV, P.V. BEREZIN (Russian Federation)

One of the important questions, regarding the thermokarst development, is to find the principles of its distribution and dynamics with the purpose of forecasting environmental changes. Many researchers studied the thermokarst processes, but proper statistical methods regarding these are yet to be developed. In particular, the analysis of quantitative aspects of thermokarst is to be considered. Various researches attempted to determine the age of thermokarst lakes, as well as the time of their occurrence. In this work we try to investigate and compare several models of the lake development by means of modeling and remotely sensed data. The first model is formulated on the basis of empirical data that were acquired from papers of Burn, Shur and other authors. We attempted elaborating the model, when the growth rate of lakes is random and constant with time. If so, at the specific moment of time the average size of the lakes should be of normal distribution. The second model was formulated by A.S Viktorov, and it implies that the growth rate of lakes is proportional to their size, and at the specific moment of time, lake diameters should be of lognormal distribution. Also, for each of the models we considered the situation of synchronous and asynchronous start of the thermokarst processes. As a result, we came up with four distributions and we also looked for conformity of theoretical and experimental data. We performed the model approval for several study areas, which are located in different Arctic regions of Russia, Canada, and of Alaska. We selected the study sites based on the morphological homogeneity of those and on the availability of the remotely sensed imagery. For the selected lakes we evaluated the relationship of empirical and theoretical distributions of the lake areas.



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# The basic concepts of the geosystems theory

Vladislav SYSUEV (Russian Federation)

Substantiates the basic axioms and concepts of constructing a theory of geosystems. Show that the use of the basic concepts of differential geometry and mathematical physics are at least a necessary condition for the theoretical description of the structure and functioning of geosystems. Differentiation algorithms of natural territorial complexes are based on the classical definitions of landscape. Pixels of three-dimensional digital terrain models of appropriate scale are the elementary material points (similar to material particles theoretical mechanics), from which the construction of elementary geosystems and their hierarchy. Parameters of the geosystems status are: geographic coordinates, gradients variables of geophysical force fields (solar radiation, gravity, chemical potentials, etc.), remote sensing digital data, parameters of productivity of the soil and vegetation, etc. Mathematical modeling of the structure and geosystem processes based on physical laws varying degrees of fundamental. Function model of geosystems through the boundary conditions and the relationship between the parameters are closely related to their structure. All models of the processes and structures are verified by field experimental data obtained under different environmental conditions. Theoretical approach to the description of geosystems allows to put mathematical problem of optimizing the anthropogenic landscapes and optimal control of natural managements. On simulation-base of site conditions and stand dynamics established technique of long-term sustainable landscape planning of forestry. Differentiation of natural territorial complexes and modeling of runoff allowed to build a complex hydrological forecasting and watershed geosystems zoning.



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**Landscape pattern investigation based on mathematical morphology of landscape approach for the regions with subsidence and suffusion activity**

Sergey SADKOV (Russian Federation)

Subsidence and suffusion are one of the dangerous geological processes in arid and semiarid regions. It may particularly take place in loess grounds from forest-steppe to desert zone. The proposed method allows investigation of the subsidence and suffusion process development grade using landscape pattern analysis based on mathematical morphology of landscape approach. This basic model of subsidence and suffusion was employed in the investigation. According to the model, the landscape pattern should have the following qualities: • At any chosen moment of time the number of depressions is of a Poisson distribution on a randomly selected area; • At any chosen moment of time the area of a depression is distributed lognormally. The theoretical results have been tested on a series of study areas, having different physiographic conditions. The key areas are located within the Central Russian Upland, Caspian Lowland, West-Siberian Plain, the submontain plain of Kopet Dag (Turkmenistan). The depression borders were delineated, using satellite imagery interpretation. The field verification was committed by using the results of the filed works in the Janibek Science Station (Caspian Lowland).



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## Effect of landscape spatial pattern on faunal diversity

Ksenia MEREKALOVA, Alexander KHOROSHEV, Lyudmila EMELYANOVA (Russian Federation)

The study hypothesized importance of the landscape spatial structure as a factor of faunal diversity differentiation. It is assumed that the spatial pattern of the landscape contributes to the needs of animals in different habitat types, combinations of different types of forage bases and in providing favorable conditions for daily and seasonal migrations. The spatial structure of the landscape is quantifiable in the form of several indicators which are tested as possible predictors of faunal diversity. The main subject of the study is the viability of populations of zonal boreal species in the highly fragmented by farmlands middle-taiga landscape of European Russia. Some of the species from groups of rare, game and key species of mammals were selected as indicators. As hypothetical factors affecting the viability of indicator species and total faunal diversity the following effects were examined: 1) isolation of forest patches from primary forest landscape by cultivated fields; 2) the influence of different types of adjacent treeless patches providing part of forage reserve for forest species; 3) the influence of a size of isolated forest patch on occurrence of core and edge effects; 4) high original abiotic mosaic structure of landscape. To assess the diversity of land cover of key areas and their surroundings remote sensing data classification was performed and different types of land cover were identified. Then for the classified image landscape metrics that determine the diversity (Shannon index), edge density and isolation of key habitats were calculated in different surroundings. The obtained results of the landscape diversity analysis were compared with data on the general faunal diversity and occurrence of indicator species in key areas.



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IGU2015 – 1103

# Mathematical Modeling of Agricultural Landscape Pattern within the Forest Zone of the East European Plain

Olga TRAPEZNIKOVA (Russian Federation)

The aim of the research is to find quantitative parameters for rural settlement and agricultural landscape patterns in different nature conditions. The analysis of agricultural landscape pattern should take into account rural settlements as the centers of corresponding elementary agricultural landscapes as far minimizing distance to the settlement decreases labor expenditure. The research was done in Kargopol area, the northernmost agrarian region of Russia. The majority of the region is occupied with Carbon karst plateau. The settlement pattern here is characterized with location of village clusters around rather large and shallow karst lakes, which in turn obey the Poisson law according the theory of mathematical morphology of landscape (Alexey Victorov). It was empirically tested that centers of the village clusters obeyed the Poisson law and empirical vicinity coefficient proved the random distribution of villages, not usual for other settlement patterns. The second settlement pattern occurs within river valleys. This type of rural settlement pattern is widely spread in taiga zone. The valley settlement pattern is often characterized with pair symmetry of villages on two banks of the river. Every valley can be characterized with its own symmetry coefficient, which shows closeness of real settlement pattern to ideal symmetrical location. Other parameters of the valley pattern are settlement density along and across the valley, distance distribution from the river, and others. The third type of settlement pattern is within glaciolacustrine depressions with rather rich soil and the lake in the center of depression. The empirical parameters of this pattern were found, including settlement density within the depression and its dependence on the distance from the lake.



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IGU2015 – 2641

## Multiscale organization of landscape structure

Alexander KHOROSHEV (Russian Federation)

Contradiction between local scale of data collection and regional scale of nature management encourages landscape science to focus on multiscale organization of a landscape structure. Elaboration of methods how to translate information from one scale to another is a matter of crucial importance. Since landscape is an interrelated system of components and sub-systems, density of intercomponents relations and resulting emergent properties are key issues of research. We performed field research in several forest regions of Russia and propose a set of interrelated statistical tools to evaluate contributions of higher-order geosystems to spatial variation in local landscape units. Higher-order geosystems were characterized by relief pattern evaluated from DEM. Vertical and horizontal curvature and dissection were calculated for various sizes of moving window followed by comparison of resulting models quality. We argue that discrete and continual properties co-exist in the same landscape space. To make distinction between them means to make correct choice of research scale. Landscape unit is involved by various groups of properties simultaneously in processes acting in several characteristic spatial scales. Principal components analysis techniques were applied to separate properties of soils and phytocoenoses that i) obey to higher-order geosystems, ii) depend on self-development in situ. We demonstrate how a set of multiple regression non-linear models enables us to determine characteristic spatial scale of geosystem that impose control on this or that group of properties. Type of linkages is described by set of statistically significant regression coefficients. Proposed procedure is used to identify areas with different types of intercomponent relations and, hence, with different binding factors of spatial organization. By means of probabilistic mapping we show degree of concordance between properties of landforms, bedrocks, soil and phytocoenoses. This allows forecasting state of equilibrium or disequilibrium under exterior impacts.



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IGU2015 – 2004

**The geometry of the landscape space and its evaluation methods through remote sensing data**

A. KRENKE, Yu. PUZACHENKO (Russian Federation)

The geometry of space is determined by the metric actually describing the shape of the interaction of parts and particles in the system. It is assumed that the landscape is an anisotropic structure and can consist of various metric spaces at different hierarchical levels and in different types of terrain. Remote sensing data describe the basic physical properties of the surface and can be considered as a source of vector basis describing the landscape. This vector space reflects the geometry of interaction idividual parts of the landscape. Thus, the problem reduced to finding the optimum partition of the landscape at each hierarchical level on the functional community using a variety of metrics. Such search can be made through the entropy approach using adequate indices (Tsallis entropy, the Renyi entropy and so on.). The solution to this problem is crucial for the quantitative analysis of the organization, self-organization and functioning of landscapes and ecosystems, since the processes in these systems is determined by their geometry.



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IGU2015 – 1907

**Proposal of the approach to model the ridge-hollow bog spatial structure within the Belamoro-Kuloyskoye plateau area (Arkhangelsk region of Russia)**

Timofey ORLOV, Sergey SADKOV, M. ARHIPOVA, Evgeny PANCHENKO (Russian Federation)

Bogs and fens are widely spread across the Belomoro-Kuloyskoe plateau (Arkhangelsk region). They are located at the tops of moraine and fluvioglacial hills, as well as within the depressions among those. Many of the raised bogs have the ridge-hollow patterns of different types. The goal of the research was to develop the approach to the bog pattern mathematical parameterization. The research was committed based on using the satellite imagery (Landsat-8, GeoEye), ground penetrating radar (GPR) profiles, peat drilling, and on the vegetation cover field descriptions. In order to mathematically parameterize the ridge-hollow pattern we employed the approach as is described below. The ridge-hollow pattern consists of an assembly of simple and embowed parts of intersected ridges. The elementary ridge sections are divided by the hollows covered with sphagnum or with open peat. The ridge intersections can be considered the framing points of the general pattern. At the first step of the pattern parameterization we employed only parts of the ridge-hollow pattern which are either straight or nearly straight. We have discriminated five pattern types. They differ in the vegetation cover, peat depth, hydrological condition and the peat bed shape. Several key parameters were estimated for the distinguished pattern types: - Average number and width of ridges and hollows along the profile; - Number of ridge connections per area, and the spatial distribution of ridge connections; - Average square and the distribution of the hollows by area; - Local and whole curve of ridges. The square of hollows is log normally distributed for all the types of patterns. Ridge intersection points are subordinate to the Poisson distribution at the singular and double size of estimation radius. Hence, we conclude that the mathematical parameterization allows discriminating different types of bogs based on the ridge hollow pattern of those. We also suggested several key parameters for the evaluation of the ridge-hollow bog spatial structures.



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IGU2015 – 2671

**Evaluating micro-scale soil erosion processes through landscape metrics**

Alexandre Marco da SILVA, Chi Hua HUANG, Wendy FRANCESCONI, Thalika SAINTIL, Jazmin VILLEGAS
(Brazil)

When landscape ecology- and soil erosion-related studies are compared, some similarities might be found. Here we aim presenting some results regarding the performance of landscape metrics when used as indicators of the configuration of surface micro-topography and erosion-related features. Through a indoor experiment carried out at National Soil Erosion Research Laboratory (West Lafayette, IN, USA) using an experimental slope segment contained in a box of 9.75 m length by 3.66m width and 4.1% slope, digital photos were systematically taken, processed, classified (bimodal, automatic system) in four moments: when the soil surface was still dried, pre-wetted and after application of two simulated heavy storms. After, some landscape-related metrics were calculated from these images using a freeware. The metrics shape index, fractal dimension, largest patch index, and percentage of land, showed clear changes after the application of high volumes of rain. This means that during the application of the rains, a significant change in the value of these metrics indicated that the soil particles had their rheological properties altered. Possibly, the main eco-hydrologic process related to the modifications reported by the data is the loss of sinuosity of the channels, which means the loss of roughness. The use of this innovative approach to describe spatial the configuration of soil surface and erosion processes is very promising, because it is an easy, inexpensive, and fast way. Using landscape metrics in erosion studies scaling down or scaling up could offer information on the application of this approach for different purposes.



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**The Influence of the Russian Geosystemic Geography in Brazilian Geosystemic Geography: Historical Background and Future Prospects for Landscape Studies**

Danilo PICCOLI NETO, Archimedes PEREZ FILHO (Brazil)

The Russian geosystem conception arrives in Brazil through the Brazilian geographer Monteiro that by participating in the International Congress of Geography held in Moscow in 1976, followed by a excursion to Novosibirsk and the Institute of Geography of Siberia and the Far East, makes contact with the report developed by Sochava (especially published for the event IGU) and his team, especially Snytko and Krauklis. Monteiro receives permission to reproduce the article "The study of geosystems" in Portuguese, which is published in 1977. Quickly the Russian geosystems idea is accepted by Brazilian geographic community, which had taken a first contact with the idea of Bertrand in 1968 and also received the influence of the theory of general Bertalanffy systems. In the Brazilian physical geography, the Russian geosystemic conception becomes one of the main paradigms and the integration of landscape and the physical systems are regarded from this perspective, being nowadays basis of much of the study, publications and theses. However, the references has remained almost exclusively the same decades ago, no new interactions with the current development of the Russian systemic geography, by factors such as the language barrier and the lack of interchange of researchers. New Russian literature in English has allowed Brazilian geographers update the concepts and make contact with more complex approaches about geosystems, as the landscape metrics, new quantitative analyzes of patterns and predictions and mathematical modeling. Since it has an widely diffusion in Brazil, it would be beneficial the interaction with the new perspectives of geosystems developed in Russia, as in the Lomonosov Moscow State University and in VB Sochava Institute of Geography.



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IGU2015 – 3688

**Comparison of spatial features of soil solid-phase transport in two small catchments (in forest-steppe and steppe zones of Russia)**

T.S. KOSHOVSKII, A.P. ZHIDKIN, A.N. GENNADIEV (Russian Federation)

Studied catchments are located in Tula and Kursk regions of Russia. Soil samples were taken on 9 catenas on the entire area of the catchments in layer 0-50 cm (more than 160 points). Transport of soil solid-phase material was studied by the magnetic tracer method. This method is based on assessments of redistribution of spherical magnetic particles (fly ash components) on the slopes. For comparative assessments were used maps of spherical magnetic particles reserves distribution in the catchments, constructed interpolation. Catchments areas were divided in three sections: zones of soil erosion, zones of soil accumulation and transit-buffer zones. To the transit-buffer zones were taken areas with low soil erosion and accumulation rates in total for studied period one hundred years, less then method error (for these territories about 0.25-0.30 mm/yr). Different types of zones of soil matter transport were divided by topographic position index according to the values of the index (relatively ± 0.5 σ). Assessment of migration structure of the catchment was based on ratios of square of zones of soil erosion and accumulation, balance of the soil solid phase transport within the arable part of the catchment, analyses of spatial location erosion and accumulation zones. Revealed that the ratio between squares of soil erosion / accumulation / transit-buffer zones in catchment in forest steppe region was 20/19/61%. In the catchment in steppe region ratio was very close - 23/18/59%. In spite of similar values of received proportions revealed similar trends of location of the zones within studied catchments. Received similarity is of great interest for check on the other catchments. This research is funded by Russian Foundation for Basic Research – Project 13-05-00098.



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# Pan-Eurasian Experiment (PEEX)

## Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 1

**Chairperson(s):** *Sergey DOBROLYUBOV, Natalia CHUBAROVA*

- Project SLICFONIA: complicated study of short-lived climate forcers in the Arctic

  *A.SKOROKHOD, A.STOHL, R.THOMPSON, V.SHEVCHENKO, A.VINOGRADOVA, V.KOPEIKIN, V.RAKITIN (Russian Federation)*

- A large-scale assessment of climatic and ecological impacts of tropospheric sulphate aerosols on the terrestrial carbon cycle

  *Alexey V. ELISEEV (Russian Federation)*

- Model assessment of global CO2 emissions into the atmosphere from crown, ground, and peat fires

  *Alexey V. ELISEEV, I.I. MOKHOV, A.V. CHERNOKULSKY (Russian Federation)*

- Wildfire forest and peat aerosol emissions in PEEX regions

  *Olga POPOVICHEVA, KOZLOV V., G. ENGLING, N. SHONIJA, K. ELEFTERIADIS (Russian Federation)*

## Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 2

**Chairperson(s):** *Sergey DOBROLYUBOV*

- Influence of coherent structures on the temporal variability of wind field and gas constituents in the troposphere

  *Igor CHUNCHUZOV, Sergey KULICHKOV, Vitaly PEREPELKIN, Oleg POPOV, Margarita KALLISTRATOVA, Anatoly DZHOLA, Lv JUN, Yang YICHUN, Wu LIN (Russian Federation)*

- Estimation of integral content of polluting gases in troposphere and their sources at Moscow Region

  *Alexander BOROVSKI, I.I. BRUCHKOVSKY, A.S. ELOKHOV, A.N. KRASOVSKY, V.A. IVANOV, O.V. POSTYLYAKOV (Russian Federation)*

- Sustainability of carbon fluxes between forest and bog ecosystems in southern taiga of European Russia

  *Juliya KURBATOVA, J. KURBATOV, V. AVILOV, D. IVANOV, A. VARLAGIN (Russian Federation)*

- Near-shore water mass structure and circulation in the south-eastern part of the Baltic Sea

  *Alexander DEMIDOV, Stanislav MYSLENKOV, Evgeny KRAYUSHKIN, Vsevolod CHUGAEVICH (Russian Federation)*



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**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 3**

**Chairperson(s):** *Sergey DOBROLYUBOV*

- Ongoing increase of atmospheric convective activity in Northern Eurasia: observations, reanalyses and model simulations

  *Alexander CHERNOKULSKY, M.V. KURGANSKY, I.I. MOKHOV (Russian Federation)*

- Implementation of SWAN model with COSMO-CLM wind forcing for the Barents Sea storm events (case study)

  *Vladimir PLATONOV, Stanislav MYSLENKOV (Russian Federation)*

- The influence of swell waves from the North Atlantic on the wave field in the Barents and White seas

  *Stanislav MYSLENKOV, V.S. ARKHIPKIN, K.P. SILVESTROVA (Russian Federation)*

- The oxygen regime of shallow lake

  *Galina GAVRILENKO, Galina ZDOROVENNOVA, N. PALSHIN, R. ZDOROVENNOV, S. GOLOSOV, T. EFREMOVA, A. TERZHEVIK (Russian Federation)*

- Aerosol optical depth retrieval over arctic region using satellite data

  *Yong XUE (China), Linlu MEI (China)*

**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 4**

**Chairperson(s):** *Valery BONDUR, Sergei ZILITINKEVICH*

- Pan-Eurasian Experiment (PEEX) Program - Grand Challenges in the Arctic-boreal context

  *Markku Kulmala, H.K. LAPPALAINEN, T. PETÄJÄ, T. KURTEN, V.-M. KERMINEN, Y. VIISANEN, V. KOTLYAKOV, N. KASIMOV, V. BONDUR, G. MATVIENKO, A.BAKLANOV, HD. GUO, S. ZILITINKEVICH (Finland)*

- Methods of satellite monitoring for the purpose of the Pan-Eurasian Experiment(PEEX)

  *Valery BONDUR (*Russian Federation*)*

- Synergetic retrieval of terrestrial aerosol optical depth by using MODIS satellite data of Terra and Aqua

  *Jiahua ZHANG, Junliang HE, Yong ZHA (China)*

- A GPP assimilation model in southeastern Tibetan Plateau coupled CO2 eddy covariance flux tower and remote sensing information



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*Jiahua ZHANG, Yan JIANG (China)*

- Influence of natural and anthropogenic emissions of greenhouse and polluting gases on climate and ecosystem changes in Eurasia (Presentation of new PEEX labelled project)

  *Andrey SKOROKHOD, G.GOLITSYN (*Russian Federation*)*

**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 5**

**Chairperson(s):** *Sergey DOBROLYUBOV*

- Pan-Eurasian Experiment (PEEX) research agenda - System understanding of the Arctic-boreal regions for scenarios and assessments of the the Northern Pan-Eurasian environments

  *Hanna LAPPALAINEN (Finland)*

- Possibilities of space-borne monitoring of atmosphere pollution in Northern Eurasia in the framework of the Pan-Eurasian Experiment (PEEX)

  *E.S. MITYUSHINA, V.G. BONDUR, O.S. VORONOVA, A.P. TUSHNOVA (Russian Federation)*

- Studying emissions of trace gases and aerosols resulting from wildfires into the atmosphere of Northern Eurasia with satellites

  *C.A. ARUTYUNYAN, V.G. BONDUR, M.A TARASOVA (Russian Federation)*

- Numerical study of water-atmosphere gas exchange parameterization for a boreal lake

  *Sofya GUSEVA, V.M. STEPANENKO (Russian Federation)*

**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 6**

**Chairperson(s):** *Sergey DOBROLYUBOV*

- Assessment of the Biospheric Contribution to Surface Atmospheric CO2 Concentrations over East Asia with a Regional Chemical Transport Model

  *Meigen ZHANG, Xingxia KOU, Zhen PENG, Yinghong WANG (China)*

- Cold CO2 emission from sub-boreal soils: current trends and effect of repeating freezing-thawing events

  *Irina KURGANOVA, Valentin LOPES DE GERENYU, Tatiana MYAKSHINA, Dmitry SAPRONOV, Valery KUDEYAROV (Russian Federation)*

- Observations and modeling of carbon fluxes from peatlands at Southern Taiga of Western Siberia

  *Egor DYUKAREV, Eugenia GOLOVATSKAYA, Elena VERETENNIKOVA (Russian Federation)*



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**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 7**

**Chairperson(s):** *Tuukka PETÄJÄ, Hanna LAPPALAINEN*

- Cognitive chaos: turbulence in the Earth system

  *Sergej ZILITINKEVICH (Finland)*

- Web-GIS based virtual research environment for Northern Eurasia climatic studies

  *Evgeny GORDOV, V.N. LYKOSOV, V.N. KRUPCHATNIKOV (Russian Federation)*

- Satellite and ground based measurements: comparison of CO and CH4 total contents for background and polluted conditions

  *Vadim RAKITIN, N. ELANSKY, A. SKOROKHOD, Yu. SHTABKIN, N. PANKRATOVA, A. SAFRONOV, A. DZHOLA (Russian Federation)*

- Background CO and CH4 total contents: long-term IAP spectroscopic datasets, typical and abnormal variations and temporal tendencies

  *Eugeny GRECHKO, A. DZHOLA, V. RAKITIN (Russian Federation)*

- Towards the harmonized PEEX project observational infrastructure: Building the metadatabase

  *Pavel ALEKSEYCHIK, Hanna LAPPALAINEN, J. KUJANSUU, Tuukka PETÄJÄ (Finland); Nina ZAYTSEVA (Russian Federation)*

**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas» 8**

**Chairperson(s):** *Sergey DOBROLYUBOV*

- Paradox of the surface air cooling in response to the global warming: A role of the stably stratified PBL and free atmosphere temperature inversions

  *Igor EZAU (Norway)*

- Temporal and spatial variability of biologically active UV radiation and UV resources over northern Eurasia

  *Natalia CHUBAROVA, Ekaterina ZHDANOVA (Russian Federation)*

- Investigation of atmospheric composition using ground-based methods in cloudy conditions at Russian-Belorussian DOAS Network

  *Oleg POSTYLYAKOV, M.S. ANDREEV, A.S. ELOKHOV, A.P. MEDVEDEV, A.I. CHULICHKOV, S.K. BORODKO, A.N. BOROVSKI, I.I. BRUCHKOUSKI, V.A. IVANOV, A.N. KRASOUSKI, A.G. SVETASHEV (Russian Federation)*



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- Biogenic Aerosols - Effects on Clouds and Climate (BAECC) project as a showcase for benefits of comprehensive atmospheric observations

  *Tuukka PETAJA, K. ATLASKINA, A.J. MANNINEN, E.O. CONNOR, D. MOISSEEV, V. SiNCLAIR, H.K. LAPPALAINEN, M. KULMALA, V.-M. KERMINEN (Finland)*

**POSTER EXHIBITION**

**Pan-Eurasian Experiment (PEEX) – A Research Initiative Meeting «The Grand Challenges Of The Changing Environment Of The Northern Pan-Eurasian Arctic-Boreal Areas»**

- Black carbon studies in the atmosphere over the White, Barents, Greenland and Kara seas during the summer 2014

  *Vladimir SHEVCHENKO, V.M. KOPEIKIN, I.A. GOVORINA, M.S. MAKHOTIN, A.N. NOVIGATSKY (Russian Federation)*

- Evaluation of convective boundary layer parameterizations based on LES data

  *Andrey DEBOLSKIY, V.STEPANENKO (Russian Federation)*

- A GPP assimilation model in southeastern Tibetan Plateau coupled CO2 eddy covariance flux tower and remote sensing information

  *Jiahua ZHANG, Yan JIANG (China (Beijing))*

- Aircraft-borne measurements over Southern Finland during the PEGASOS 2013 campaign

  *Riikka* VÄÄNÄNEN, R. KREJCI, H. E. MANNINEN, T. NIEMINEN, T. YLI-JUUTI, J. KANGASLUOMA, T. POHJA, P. P. AALTO, T. PETÄJÄ, M. KULMALA (Finland)

- Verification of Aerosol Diffusion Spectrometer on the measurement of atmospheric aerosol particles

  *Xuemeng CHEN, S. DUBTSOV, H. E. MANNINEN, T. NIEMINEN, P. AALTO, T. PETÄJÄ, M. KULMALA (Finland)*

- An interactive tool for calculations of UV doses and UV resources.

  *Ekaterina ZHDANOVA, Natalia CHUBAROVA (Russian Federation)*

- Long-term variability of UV radiation in 300-380 nm spectral regionin Moscow according to long-term measurements and reconstruction model

  *Yelena NEZVAL', Natalia CHUBAROVA (Russian Federation)*

- Black Carbon Atmospheric Emissions From Russian Oil/Gas Industry Open Fires

  *Anna VINOGRADOVA (Russian Federation)*



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- Impact of freezing events of different intensity on CO2 fluxes from temperate soils: the results of manipulation experiment

  *Valentin LOPES DE GERENYU, Dmitriy KHOROSHAEV, Irina KURGANOVA, Evgeniya BLAGODATSKAYA (Russian Federation)*

- Drought effect on CO2 fluxes from temperate soils: the results of precipitation manipulation experiment

  *Irina KURGANOVA, Valentin LOPES DE GERENYU, Dmitry KHOROSHAEV, Evgenia BLAGODATSKAYA (Russian Federation)*

- Methane Emissions From Northern Lakes In Karelia And Western Siberia

  *Leonid GOLUBYATNIKOV (Russian Federation)*

- Long-term variability of aerosols in Moscow according to AERONET, their radiation effects and comparison with the results of radiative calculations in COSMO-Ru mesoscale model

  *A.A. Polyukhov, N.E. Chubarova, G.S. Rivin, M.V. Shatunova (Russian Federation)*

- Optical properties of Lake Vendyurskoe

  *Galina GAVRILENKO, Roman ZDOROVENOV, G. ZDOROVENNOVA, N. PALSHIN, T. EFREMOVA, S.GOLOSOV, A. TERZHEVIK (Russian Federation)*

- Smoke events over boreal Eurasia: optical properties, radiative effects and air pollution

  *Gennady GORCHAKOV (Russian Federation)*

- Seasonal variations of near-surface carbon monoxide (CO) concentration in central Siberia in 2007 – 2012, according to ZOTTO observatios and model simulation

  *Yury SHTABKIN (Russian Federation)*

- Ozone and nitric oxides in the Surface Air over Russia: background conditions and extreme cases

  *Natalia PANKRATOVA, N. F. ELANSKY, A. I. SKOROKHOD (Russian Federation)*



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IGU2015 – 1442

## Project SLICFONIA: complicated study of short-lived climate forcers in the Arctic

A.SKOROKHOD, A.STOHL, R.THOMPSON, V.SHEVCHENKO, A.VINOGRADOVA, V.KOPEIKIN, V.RAKITIN
(Russian Federation)

SLICFONIA (Emissions of Short-Lived Climate Forcers near and in the Arctic) is Russian-Norwegian scientific project focused up-to-date atmospheric changes occurring in the Arctic and started in 2014. The short-lived climate forcers (SLCFs) black carbon (BC) and methane (CH4), are particularly important at high latitudes. BC absorbs solar radiation in the atmosphere, especially over highly reflective surfaces, and when it is deposited on snow/ice. CH4 emissions from wetlands and permafrost and biomass burning emissions of BC and CH4 are susceptible to high-latitude climate change. Lastly, emissions of BC and CH4 from the expanding oil and gas industry in northern regions are becoming increasingly important. To establish a baseline before even larger changes occur, SLICFONIA will determine the current emissions of BC and CH4 in Arctic Eurasia and, in particular, it will quantify gas flaring emissions from the oil and gas industry. The project performed new measurements of BC in the atmosphere on the northwest coast of the White Sea, as well as measurements of BC in the atmosphere and in the snow during land expeditions in the northern part of European Russia and during ship cruises in the White, Kara, and Barents Seas in 2014-2015. It also uses BC and CH4 data (including CH4 isotopic information) from stations on Svalbard, in Norway, Siberia and from other Arctic and high-latitude sites. Optimal use of these data for quantifying high-latitude BC and CH4 emissions will be made through rigorous comparisons with a new emission data set coupled to a transport model and a Bayesian inversion approach. Their impact on Arctic BC and CH4 burdens will be determined. During 2014-2015 the data of Russian Hydrometeorological Service (Roshydromet) on emissions of air pollutants from Russian cities and regions in order to assess the spatial distribution of BC emission from the country have been considered. The analysis included 60 regions and more than 100 cities and towns in Russia. The spatial distribution of BC annual emissions from the territory of Russia on the grid (1 × 1) degree has been calculated. In general, anthropogenic emissions from the territory of Russia (within 50-72 N × 20-180 E) are estimated at 170 thousand tons per year. It is shown that in the northern regions of Western Siberia black carbon pollution of the environment can reach the level of medium-sized cities in Russia, due to the sources of atmospheric emissions on the territory of the Yamal-Nenets and Khanty-Mansi Autonomous Okrugs. FLEXPART Lagrangian particle dispersion model has been used to interpret BC and CH4 concentration data from surface stations, ship campaigns, snow sampling. Results of inverse modelling revealing contribution of different SLCFs sources are presented.



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IGU2015 – 0834

# A large-scale assessment of climatic and ecological impacts of tropospheric sulphate aerosols on the terrestrial carbon cycle

Alexey V. ELISEEV (Russian Federation)

Tropospheric sulphate aerosols (TSA) may hurt the photosynthesising tissues if they are taken up by plants. A parametrisation of this impact of tropospheric sulphate aerosols (TSA) on the terrestrial gross primary production is suggested. This parametrisation is implemented into the global Earth system model developed at the A.M. Obukhov Institute of the Atmospheric Physics, Russian Academy of Sciences (IAP RAS CM). With this coupled model, the simulations are performed which are forced by common anthropogenic and natural climate forcings based on historical reconstructions followed by the RCP 8.5 scenario. The model response to sulphate aerosol loading is subdivided into the climatic (related to the influence of TSA on the radiative transport in the atmosphere) and ecological (related to the toxic influence of sulphate aerosol on terrestrial plants) impacts. We found that the former basically dominates over the latter on the global scale and modifies the responses of the global vegetation and soil carbon stocks to external forcings by 10%. At regional scale, however, ecological impact may be as much important as the climatic one. This work was supported by the Russian Scientific Foundation (grant 14-47-00049).



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IGU2015 – 0836

# Model assessment of global CO2 emissions into the atmosphere from crown, ground, and peat fires

Alexey V. ELISEEV, I.I. MOKHOV, A.V. CHERNOKULSKY (Russian Federation)

The scheme for natural fires implemented in the climate model (CM) developed at the A.M. Obukhov Institute of Atmospheric Physics (IAP RAS) is extended by a module accounting for ground and peat fires. With the IAP RAS CM, the simulations are performed for 1700–2300 in accordance with the CMIP5 (Coupled Models Intercomparison Project, phase 5) protocol. The modelled present-day burnt area, BA, and the corresponding CO2 emissions into the atmosphere E agree with the GFED–3.1 estimates at most regions. In the 21st century, under the RCP (Representative Concentration Pathways) scenarios, the global BA increases by 10–41% depending on scenario, and E increases by 11-39%. Under the mitigation scenario RCP 2.6, both BA and E slightly decrease in the 22nd-23rd centuries. For scenarios RCP 4.5, RCP 6.0, and RCP 8.5, they continue to increase in these two centuries. All these changes are mostly due to changes in natural fires activity in the boreal regions. Ground and peat fires contribute significantly to the total emissions of CO2 from natural fires (20-25% at the global scale depending on scenario and calendar year). Peat fires markedly intensify interannual variability of regional CO2 emissions from natural fires. This work was supported by the Russian Scientific Foundation (grant 14-47-00049).



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IGU2015 – 4239

**Wildfire forest and peat aerosol emissions in PEEX regions**

Olga POPOVICHEVA, KOZLOV V., G. ENGLING, N. SHONIJA, K. ELEFTERIADIS (Russian Federation)

Wildland fires are a major source of carbonaceous particulate matter (PM) in the global atmosphere. Biomass burning yields a large amount of smoke aerosols, affecting the global carbon cycle, radiation heat exchange, and aerosol/cloud/climate interactions. Quantification of the atmospheric pollution and impacts of wildfires on climate change in the Pan-Eurasian region as well as the Arctic is one of the most important research priorities. Impacts of intense Siberian forest fires in summer 2012-2013 and long-lasting peat bog smoldering in the European part of Russia in summer 2014 at regional scale were examined during background observations. We performed aerosol monitoring and sampling at the Tomsk station of IAO RAS and Moscow city site as well as in near – wildfire source measurement campaigns in the Tomsk and Moscow regions. PM and black carbon (BC) mass concentrations are provided together with PM speciation. Elevated PM, OC, BC, and tracers of biomass burning (levoglucosan and potassium ion) during intensive wildfire events show the impacts of wildfires on air quality and aerosol chemistry. Hazardous constituents from forest and peat fires such as nitrates and sulfates, acid and non-acid carbonyl compounds, transition and alkali earth metals, and their soluble chemical forms are released into the atmosphere and secondary species are formed together with carbonaceous particles, ash, and carbonates evolved from soil dust during large wildfires. These environmentally-dangerous species constitute important fingerprints of biomass burning emissions, indicating the pathways and mechanisms of release and transport of organic and BC pollutants in the PEEX regions.



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**Influence of coherent structures on the temporal variability of wind field and gas constituents in the troposphere**

Igor CHUNCHUZOV, Sergey KULICHKOV, Vitaly PEREPELKIN, Oleg POPOV, Margarita KALLISTRATOVA, Anatoly DZHOLA, Lv JUN, Yang YICHUN, Wu LIN (Russian Federation)

The results of simultaneous measurements of the temporal variations in wind velocity, atmospheric pressure and gas constituents (NO2, NO) near Moscow and Beijing are presented here. The atmospheric pressure variations were measured by a triangular network of microbarographs in Moscow simultaneously with the vertical profiles of wind velocity by using Doppler SODAR, and with the ground-based spectroscopic measurements of NO2 and NO. The atmospheric pressure variations near Beijing were measured by the network of infrasound sensors, whereas the variations of wind velocity were measured by acoustic/cap anemometers installed at different heights of the 350-m mast. The coherent structures were filtered from a background noise by a coherence analysis of the pressure variations at spaced points of triangular array, and of the variations of wind velocity and gas constituents. The characteristics of the coherent structures (dominant periods, spatial scales and translation speeds) in the troposphere were obtained, and their influence on temporal variability of gas components in the atmosphere has been evaluated. This work was supported by the Russian Scientific Fund under grant 14-47-00049



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IGU2015 – 2314

# Estimation of integral content of polluting gases in troposphere and their sources at Moscow Region

Alexander BOROVSKI, I.I. BRUCHKOVSKY, A.S. ELOKHOV, A.N. KRASOVSKY, V.A. IVANOV, O.V. POSTYLYAKOV
(Russian Federation)

Regular observations of the integral content in the lower troposphere of formaldehyde (HCHO) and nitrogen dioxide (NO2) are performed in Moscow and Moscow Region since 2008. They use measurements of spectral intensity of scattered solar radiation performed in visible and UV spectral regions where HCHO and NO2 have significant absorption. Formaldehyde is short-lived product of volatile organic compounds (VOCs) oxidation, therefore HCHO abundance in the atmosphere is related to VOCs' anthropogenic and natural sources. HCHO and NO2 play significant role in the tropospheric chemistry of ozone. Therefore HCHO and NO2 observations are an important part of the air quality control [1,2]. We will present result of the analysis of HCHO and NO2 data obtained by revised algorithms. A revised HCHO algorithm takes into account a variability of surface albedo and height of atmosphere boundary layer. Temperature effect in HCHO data, which probably relates to higher abundance of HCHO precursors (mainly isoprene) at higher temperatures, is confirmed and quantified. Moscow megacity influence on HCHO content at Zvenigorod is shown and quantified. This research was supported by the Russian Scientific Fund under grant 14-47-00049.
1. A.N. Borovski, A.V. Dzhola, A.S. Elokhov, E.I.Grechko, O.V. Postylyakov, Y. Kanaya. First measurements of formaldehyde integral content at Zvenigorod Scientific Station. Int. J. of Remote Sensing, 2014, 35:15, 5609-5627. 2. Ivanov V.A., Elokhov A.S., Postylyakov O.V. On the possibility of estimating the volume of NO2 emissions in cities using zenith spectral observations of diffuse solar radiation near 450 nm. Atmos. and Ocean. Optics, 2012, 25, 6, 539–543.



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IGU2015 – 2043

# Sustainability of carbon fluxes between forest and bog ecosystems in southern taiga of European Russia

Juliya KURBATOVA, J. KURBATOV, V. AVILOV, D. IVANOV, A. VARLAGIN (Russian Federation)

The questions of sustainability of exchange by carbon fluxes between vegetation canopy and atmosphere are in the center of ecology and politic. Long-term measurements of carbon dioxide, water and heat fluxes were conducted in bog and forest ecosystems in southern taiga of European Russia. Main subjects of the study are located in Central Forest Reserve (Tver region, 560N 33 0E). The fluxes were measured by eddy covariance and chamber methods under the oligotrophic bog and paludified shallow peat spruce forest. In general the 15-years period of studies has captured a wide range of changes of climatic conditions. The years with extreme - droughty and damp vegetative seasons and also years approached to average climatic norms for this region were during the observations. The high daily, seasonal and annual variability of uptake and emission of carbon fluxes is characteristic for ecosystems under investigations. The results of measurements of carbon dioxide fluxes have shown that southern taiga ecosystems can function during the vegetative period both as a source, and as a sink of carbon for an atmosphere. Our studies have confirmed that cumulative carbon fluxes are determined firstly by extreme weather events.



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IGU2015 – 1936

**Near-shore water mass structure and circulation in the south-eastern part of the Baltic Sea**

Alexander DEMIDOV, Stanislav MYSLENKOV, Evgeny KRAYUSHKIN, Vsevolod CHUGAEVICH (Russian Federation)

The water in the Baltic Sea is characterized by a two-layer structure - the deep and superficial layers. However, there are differences in the near shore zone associated bottom relief, seasonality and weather conditions. During joint expeditions of Moscow State University and Baltic Federal University in 2009-2014 it was carried out more than 800 CTD stations with ADCP measurements along the shore of Sambia peninsula. According to the results of work several subtypes of surface and bottom waters has been described. The September subtype is characterized by lower salinity waters. Highest and lowest temperatures were observed in July at the surface and bottom layers respectively. Vertical thermal structure in the summer has five-layer: the upper mixed layer (14-23°C , 6.4-7.4 psu) with the thickness of 7-25 m; thermocline with the thickness up to 25 m; cold intermediate layer with a thickness near 30 m with a temperature of about 3-4°C and salinity of 7.3-8 psu; halocline at a depth of 55-60 m and the bottom layer of 5-7°C temperature, the salinity reaches values of 11-12 psu. Direction of surface currents are depend on prevailing wind direction. In general, there is north transfer along the western coast of the peninsula. Thus, we described the summer vertical structure of coastal waters in the south-eastern Baltic Sea and made coastal current scheme. The work was supported by Russian Geographical Society.



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IGU2015 – 1141

# Ongoing increase of atmospheric convective activity in Northern Eurasia: observations, reanalyses and model simulations

Alexander CHERNOKULSKY, M.V. KURGANSKY, I.I. MOKHOV (Russian Federation)

Atmospheric convective activity in Northern Eurasia regions is analyzed for present climate and for the 21st century projected climate based on routine meteorological observations, modern reanalyses data and CMIP5 climate model simulations with various anthropogenic scenarios. Convective activity are assessed based on analysis of occurrence of convective clouds (cumulonimbi and cumuli) and thunderstorm events, which both are treated as visual form of atmospheric convection processes. This analysis is prepared together with an evaluation of objective convective activity indices (such as CAPE and 3D-index) and supported with a case study of tornadoes recently occurred in Northern Eurasia. A general increase of convective activity in Northern Eurasia was revealed for last four decades and can be expected for the 21st century climate.



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IGU2015 – 3545

# Implementation of SWAN model with COSMO-CLM wind forcing for the Barents Sea storm events (case study)

Vladimir PLATONOV, Stanislav MYSLENKOV (Russian Federation)

Polar lows are small, but fairly intense maritime cyclones, calling frequently extremely strong winds near seashores as well as storm surges, leading to considerable losses in coastal areas. Simulation and prediction of these severe weather events is very important and actual problem. A good resolving of such meso-scale objects and its dangerous consequences like extreme waves is possible using high-resolution modeling only. It is relevant to regional atmospheric and wave models, which has resolution about first kilometers. Case study of polar low event and associated extreme waves in Barents Sea (region of Kara Strait) was examined using coupling between regional climate model COSMO-CLM and SWAN wave model. COSMO-CLM is non-hydrostatic limited-area atmospheric model has developed by DWD (Deutscher Wetterdienst, Germany Weather Service). The COSMO-Model is based on the primitive thermo-hydrodynamical equations describing compressible flow in a moist atmosphere. The model equations are formulated in rotated geographical coordinates and a generalized terrain following height coordinate. A variety of physical processes are taken into account by parameterization schemes. The wave modeling based on the SWAN (Simulating WAves Near shore) spectral wave model. This model simulates parameters of wind waves in the open sea and coastal areas successfully. Computations were performed by using special unstructured mesh, which include the Barents and Kara seas with spatial resolution around 3 km. We are expecting this high-resolution coupling could be a good opportunity for better and more accurate resolving the spatio-temporal distribution of wind and therefore, extreme wave parameters. It is associated with detailed description of orography, sub-grid atmospheric processes, especially in planetary boundary layer, turbulence etc. in regional atmospheric model in comparison with global model outputs or global reanalysis field. These features are very important for more realistic and extensive wave structure modeling, particularly the extreme ones. Experiments were realized using the Supercomputing Center of Lomonosov Moscow State University. The experiment was executed for the period of 26 October – 2 November 2000. Initially, the first regional climate model run was implemented on 18 km resolution over the large area of Barents, Baltic, Norway seas and surrounding waters. The comprehensive ERA-Interim reanalysis forcing used as driving fields. The next run was executed in downscaling mode from 18 km COSMO-CLM output to 2.8 km resolution domain over the Barents Sea area only. Then COSMO-CLM 2.8 km output wind forcing was used as driving fields for SWAN wave model. Simulation of this case has shown the significant improvement of some characteristics. For example, it was shown that COSMO-CLM forcing provides significant wave height higher than 5 m in comparison with the wave from reanalysis ERA-Interim, which is only 4 m. Thus, the technique of high-resolution coupling between regional atmospheric and wave models could well reproduce extreme events, such as polar lows, and its main features like strong winds, pressure and temperature as well as ocean wave distribution. The further development and adaptation of this technique and its approbation on other case studies will tend to improve simulation results.



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IGU2015 –0 797

# The influence of swell waves from the North Atlantic on the wave field in the Barents and White seas

Stanislav MYSLENKOV, V.S. ARKHIPKIN, K.P. SILVESTROVA (Russian Federation)

The study of swell waves distribution from the North Atlantic to the Barents and White seas was made by using SWAN wave model. We get wind fields data from reanalysis NCEP/CFSR (resolution 0.2°, time step 1 hour). We use special unstructured computing mesh which include the North Atlantic region from equator to pole with spatial resolution around 1° and the Barents and White Seas with resolution around 0.2°. The main idea of model experiment is limitation of wind forcing above the Barents and White seas. It is real wind in North Atlantic and no local wind in the Barents sea. The limitation of forcing is way to assess directly swell influence. We calculate several cases of storms in the North Atlantic and assess the swell influence. Model ouput data abou swell height we get in several points in North Atlantic and in the Barents and White seas. It is shown that the swell influence is not strong for the white sea, but for the Barents sea it is 1-2 m. Incoming swell from north Atlantic make hard to use local wave models with open boudary for the Barents sea. The nesting grids or big unstructured mesh must be used in this cases.



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## The oxygen regime of shallow lake

Galina GAVRILENKO, Galina ZDOROVENNOVA, N. PALSHIN, R. ZDOROVENNOV, S. GOLOSOV, T. EFREMOVA, A. TERZHEVIK (Russian Federation)

The oxygen regime of shallow lake G. Zdorovennova1*, N. Palshin1, R. Zdorovennov1, S. Golosov1, 2, T. Efremova, G. Gavrilenko1 and A. Terzhevik1 1 Northern Water Problems Institute, Russian Academy of Sciences, Petrozavodsk, Russia 2 Institute of Limnology, Russian Academy of Sciences, Saint-Petersburg, Russia KEYWORDS Ice-covered lake; dissolved oxygen; anaerobic conditions. The oxygen regime of Lake Vendyurskoe (Russia, 62°10N, 33°10'E) was studied during 2007-2013. Year-round measurements of dissolved oxygen (DO-1050, RBR Ltd., Canada) were conducted at 2-3 locations. Anaerobic conditions appear in the bottom layers in the central basin of the lake in 1-2 months after freezing. The thickness of the anaerobic zone may exceed one meter by the end of winter. A wide range of DO content fluctuations is found: oscillations with a period of 6-30 minutes and amplitude of 0.1-1.2 mg l-1; fluctuations lasting from several hours to several days with amplitude of 1-1.5 mg l-1; and the sharp increase in dissolved oxygen content of 2-4 mg l-1 in 5-15 minutes, and further decrease to the previous values lasting for a few hours. Oscillations of the first and second types were observed in the surface layers of the water column, while the last-mentioned was registered only in the bottom layers. Intensification of the first two types of oscillations occurred in a number of cases against sharp changes in atmospheric pressure, usually accompanied by strong wind. The study was supported by the RFBR (projects 13-05-00338, 14-05-91761, 14-05-00787) and by EC (grant Marie Curie IRSES: GHG-LAKE № 612642).



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# Aerosol optical depth retrieval over arctic region using satellite data

Yong XUE (China), Linlu MEI (China)

Aerosol observations over Arctic region are sparse and hence there is a considerable uncertainty in the knowledge on the properties of the Arctic aerosol. Arctic aerosol observations are needed to fill this gap because these are among the basic and most important parameters for researching the Arctic environment. Atmospheric remote sensing using satellites offers us an opportunity to describe the aerosol distribution in terms of local, regional and global coverage. However, passive remote sensing of aerosols in the Arctic regions is a challenging task because the signal of snow and ice surface composes most of the top of atmosphere observed by satellite. Besides the high reflectance of snow and ice, the strong Bidirectional Reflectance Distribution Function (BRDF) effect of snow and ice is another problem during retrieval, even the simple assumption for the BRDF can greatly improve aerosol retrievals versus the use of Lambertian correction, especially with the topographic effect. In this paper, we adapted snow BRDF model to build a synergetic approach for the retrieval of AOD over snow. The method was applied to both Moderate Resolution Imaging Spectroradiometer (MODIS) data and AATSR data. The study periods using MODIS data include April 2010 and April 2011, when the Arctic haze mostly occurs. Six AERONET stations at high latitude (Andenes, Barrow, Ittoqqortoormiit, OPAL, Thule, and PEARL) were used for comparison. The correlation coefficient between retrieved AODs and AERONET AODs was 0.8 and the relative error is between 10% and 20%, demonstrating the potential of the APRS method to retrieve AOD over the Arctic, with highly reflective snow/ice surfaces and large solar zenith angles. The method is also illustrated for AATSR overpasses over Greenland with clear sky in April 2009. The comparison of the retrieved AOD with AERONET data shows a correlation coefficient of 0.75. The AODs retrieved from both MODIS and AATSR show similar temporal trends but the AERONET results are more variable and the highest AOD values are mostly missed by our algorithm. Limitations of the method are discussed. The pure snow BRDF model needs further correction in order to obtain a better estimation for mixture between snow and ice.



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**Pan-Eurasian Experiment (PEEX) Program - Grand Challenges in the Arctic-boreal context**

Markku Kulmala, H.K. LAPPALAINEN, T. PETÄJÄ, T. KURTEN, V.-M. KERMINEN, Y. VIISANEN, V. KOTLYAKOV, N. KASIMOV, V. BONDUR, G. MATVIENKO, A.BAKLANOV, HD. GUO, S. ZILITINKEVICH (Finland)

The Earth system is facing several global-scale environmental challenges, called "Grand Challenges". Grand challenges such as climate change, air quality, ocean acidification, fresh water, food supplies are the main factors controlling the human well-being, security and stability of future societies. All the grand challenges are interlinked via complex feedbacks in the Earth system. In the future, the Northern Eurasian arctic-boreal natural environment will play a crucial role for the Earth system feedback processes via the albedo change, carbon sinks and emissions, methane emissions and aerosol production via biogenic volatile organic compounds (BVOCs) (Arneth et al. 2010, Carslaw et al. 2010, Kulmala et al. 2014). In addition to atmosphere- biosphere interactions the warming of northern latitudes is related to socio-economic changes via the thawing of permafrost and the Arctic Ocean becoming ice free part of the year. If the northern sea route is opened for shipping between the Atlantic and Asia's Far East and if the exploitation of the natural resources (oil, natural gas and minerals) is increased, the global trade activities will be accelerated in the Arctic. In order to advance the understanding of the future changes in the Arctic-boreal regions and be able to apply it for reliable mitigation and adaptation planning and for the climate scenario and the early warning system development, we need a holistic science approach, which is based on the multi-scale modeling, continuous comprehensive observations and open data systems. Pan-Eurasian Experiment (PEEX) Program (https://www.atm.helsinki.fi/peex/) is covering all these components and will be producing, comprehensive understanding of the future development of the Northern Eurasian regions (Lappalainen et al. 2014, 2015). REFERENCES Arneth A. et al. (2010) Terrestrial biogeochemical feedbacks in the climate system. Nature Geosci., 3, 525–532. Carslaw, K. S. et al.. (2010) A review of natural aerosol interactions and feedbacks within the Earth system. Atmos. Chem. Phys., 10, 1701–1737. Kulmala et al. (2014) CO2-induced terrestrial feedback mechanism: From carbon sink to aerosol source and back. Boreal Env. Res., 19, suppl. B, 122–131. Lappalainen et al. (2014): Pan-Eurasian Experiment (PEEX)- a research initiative meeting the grand challenges of the changing environment of the northern Pan-Eurasian arctic-boreal areas. J. Geography, Environment, Sustainability No 2(7) pp. 1 pp. 14-48. Lappalainen H.K, Kulmala M. & Zilitinkevich S. (eds) (2015). Pan-Eurasian Experiment (PEEX) Science Plan. http://www.atm.helsinki.fi/peex/images/PEEX_SciencePlan_PROOFversion.pdf



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IGU2015 – 4232

# Synergetic retrieval of terrestrial aerosol optical depth by using MODIS satellite data of Terra and Aqua

Jiahua ZHANG, Junliang HE, Yong ZHA (China)

Aerosol optical depth (AOD) is one of the most important indicators of atmospheric pollution. It can be retrieved from satellite imagery using several established methods, such as the dark dense vegetation method and the deep blue algorithm. All of these methods require estimation of surface reflectance prior to retrieval, and are applicable to a certain pre-designated type of surface cover. Such limitations can be overcome by using a synergetic method of retrieval proposed in this study. This innovative method is based on the fact that the ratio K of surface reflectance at different angles/geometries is independent of wavelength as reported by Flowerdew and Haigh (1995). An atmospheric radiative transfer model was then established and resolved with the assistance of the ratio K obtained from two MODIS spectral bands acquired from the twin satellites of Terra and Aqua whose overpass is separated by three hours. This synergetic method of retrieval was tested with 20 pairs of MODIS images. The retrieved AOD was validated against the ground observed AOD at the Taihu station of the AErosol RObotic NETwork (AERONET). It is found that they are correlated with the observations at a coefficient of 0.828 at 0.47 lm and 0.921 at 0.66 lm wavelengths. The retrieved AOD has a mean relative error of 25.47% at 0.47 lm and 24.3% at 0.66 lm. It indicated that this method can be used to reliably retrieve AOD from the twin satellites MODIS images, namely Terra and Aqua. It is not necessary to determine surface reflectance first.



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# A GPP assimilation model in southeastern Tibetan Plateau coupled CO2 eddy covariance flux tower and remote sensing information

Jiahua ZHANG, Yan JIANG (China)

The gross primary production (GPP) at individual CO2 eddy covariance flux tower sites (GPPTower) around the southeastern Tibetan Plateau were determined by the net ecosystem exchange of CO2 (NEE) and ecosystem respiration (Re). The satellite remote sensing-VPM model estimates of GPP values (GPPMODIS) used the satellite-derived 8-day surface reflectance product, including satellite-derived enhanced vegetation index (EVI) and land surface water index (LSWI). In this paper, we assembled a subset of flux tower data at three sites to calibrate and test satellite-VPM model estimated GPPMODIS, and introduced the satellite data and site-level environmental factors to develop four new assimilation models. The new assimilation models' estimates of GPP values were compared with GPPMODIS and GPPTower, and the final optimum model among the four assimilation models was determined and used to calibrate GPPMODIS. The results showed that the assimilation models' estimates of GPP values (GPPMODEL) were much more closer to GPPTower with RE approximately 6.98% than that of GPPMODIS, indicating that the capacity of the simulation in the new assimilation model was greatly improved, the R2 and root mean square error (RMSE) of the new assimilation model were 0.57–4.90% higher and 0.74–2.47 g C m−2 s−1 lower than those of the GPPMODIS, respectively. The assimilation model was used to predicted GPP dynamics around the Tibetan Plateau and showed a reliable result. This study demonstrated the potential of the new assimilation model for estimating GPP around the Tibetan Plateau and the performances of site-level biophysical parameters in related to satellite-VPM model GPP.



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IGU2015 – 1441

**Influence of natural and anthropogenic emissions of greenhouse and polluting gases on climate and ecosystem changes in Eurasia (Presentation of new PEEX labelled project)**

Andrey SKOROKHOD, G.GOLITSYN (Russian Federation)

Observed in the recent decades, changes in the environment and the Earth's climate has a direct and deferred impact on the socio-economic development of the world. Forecast of ecosystem and climate risks needed to develop adaptation plans for industry of the countries, transport infrastructure , agriculture and other sectors of the economy to the expected changes. Its basis is the understanding and modeling of complex interactions between atmospheric processes (dynamics of different scales, changing the composition, radiative properties) and ecosystem health. For the first time within one project will be implemented attempt to study the relationship of global and regional changes in atmospheric composition on climate change, changes in ecosystems and environment of human habitation around Eurasia, in particular, on the territory of Russia and China. The project aims to study the system effects of anthropogenic and natural emissions of atmospheric constituents on climate and ecosystem changes in Eurasia. International scientific group is created on the basis of the existing with participation of IAP RAS cooperation: existing since 1992 Chinese-Russian Laboratory of Atmospheric Physics (CRLAP), Russian-Belorussian network on DOAS observations with additional experts Germany for modeling of ecosystem change. Planned experimental studies cover the territory of Easten Europe and North-Eastern Asia, which will collect information about nearly all major climatic zones and ecosystems of Eurasia. Large-scale studies of spatiotemporal distribution of greenhouse gases (GHG) and polluting species (PS), the structure of tropospheric parameters affecting transport of atmospheric pollutions over the territory of Eurasia with the results of our observations of Russian, Chinese and Belarusian monitoring stations, as well as data of international stations of Global Atmospheric Watch (GAW) and AERONET networks and satellite observations are planned to be conducted. Particular attention will be given to studies of episodes of high air pollution in megacities, industrial agglomerations and areas of natural fires. Characteristics of daily, seasonal and interannual variations, assessment of natural and anthropogenic emissions of GHG and PS for different regions and for the whole of Eurasia, prognostic assessment of changes in atmospheric composition will be obtain. Empirical data obtained in the framework of this project will be used for validation of the dynamic vegetation and the carbon cycle modules of the global climate model developed at the A.M.Obukhov Institute of Atmospheric Physics (IAP RAS CM). In doing so, the module of the vegetation dynamics will be developed in the framework of this



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project. In its turn, the IAP RAS CM's carbon cycle module will be improved by accounting for the seasonal variability of the carbon fluxes between the atmosphere and the terrestrial vegetation, and by taking into account the influence of lightning activity and anthropogenic factors on the frequency of natural fires, as well as by implementation of the scheme accounting the toxic injury of sulphate aerosols on plants. Upon validation, the model will be simulated by scenarios of external forcing consistent with the CMIP5 (Coupled Models Intercomparison Project,. phase 5) protocol. The simulations performed under such forcing will allow us to assess the response of climate and ecosystems to the external forcing expected during the 21st-23rd centuries. All simulations with a climate model will be performed in an ensemble fashion. Highly qualified experts from the A.M. Obukhov Institute of Atmospheric Physics of the Russian Academy of Sciences (IAP RAS), Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP CAS), Institute of Acoustics, Chinese Academy of Sciences (IA CAS), the Belarusian State University (BSU National Research Centre for ozone monitoring and A.N. Sevchenko Institute of Applied Physics Problems of BSU) and Max Planck Institute of Biogeochemistry (Germany) will take part in the performance of group work.
This work was supported by the Russian Scientific Fund under grant 14-47-00049



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# Pan-Eurasian Experiment (PEEX) research agenda - System understanding of the Arctic-boreal regions for scenarios and assessments of the the Northern Pan-Eurasian environments

Hanna LAPPALAINEN (Finland)

The Pan-Eurasian Experiment (PEEX) Program (https://www.atm.helsinki.fi/peex/) is a new multidisciplinary, multi-scale research initiative. PEEX research agenda focused on understanding biosphere-ocean-cryosphere-climate-society interactions and feedbacks of the Arctic - boreal regions in the North Eurasia geographical domain (Arneth et al., 2010, Carslaw et al. 2010, Kulmala et al. 2014). China is seen as as a crucial area both in source and impact point of view. The agenda covers different spatial and temporal scales, and encompasses diverse geographical regions including both natural and urban environments. The four major large-scale systems studied by PEEX are the land, atmosphere and aquatic systems, and anthropogenic activities. Each of the main systems addresses three key topics and related large-scale research questions. In addition to the four major systems, the PEEX research agenda addresses the feedbacks and interactions between the systems and the major biogeochemical cycles (water, carbon, nitrogen, phosphorus, sulfur) (Lappalainen et al. 2014, 2015). The PEEX research results are used for producing different types of scenarios and assessments on the impacts of climate change and air quality changes on human population, society, energy resources and capital flows. PEEX will also provide information for mitigation and adaptation strategies for the changing Arctic environments and societies, and will also carry out risk analysis of both human activities and natural hazards (floods, forest fires, droughts, air pollution).



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# Possibilities of space-borne monitoring of atmosphere pollution in Northern Eurasia in the framework of the Pan-Eurasian Experiment (PEEX)

E.S. MITYUSHINA, V.G. BONDUR, O.S. VORONOVA, A.P. TUSHNOVA (Russian Federation)

This paper presents an overview of modern Russian and foreign satellite systems for atmosphere monitoring in the geographical domain of Northern Eurasia. Satellite observations provide regular information on regional and global scale with spatial resolution from tens of kilometers to few meters on features of natural environment that enables detection of spatial and temporal variations of its components. An effort was made to analyze main characteristics and capabilities of space-borne monitoring systems for various atmospheric parameters, including characteristics of cloud cover, aerosol properties and concentrations of different gases. Special focus was made on determining concentration of atmospheric gases such as O3, NO2, CO, CO2, CH4, NH3, H2O, etc and aerosols. Based on the analysis, satellite data examples characterizing variability of atmospheric parameters under various natural and anthropogenic processes (wildfires, emissions of harmful gases from large cities, etc) affecting climate change and ecosystems in the region of North Eurasia are given.



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# Studying emissions of trace gases and aerosols resulting from wildfires into the atmosphere of Northern Eurasia with satellites

C.A. ARUTYUNYAN, V.G. BONDUR, M.A TARASOVA (Russian Federation)

One of the most pressing environmental issues is a change of the natural atmospheric composition under the influence of pollutant emissions resulting from wildfires (forest, steppe and peat fires). Due to these fires a large amount of trace gases and aerosols are emitted into the atmosphere. These are mainly emissions of CO, CO2, NOx, NH3, SO2, CH4 and fine aerosol (PM2.5). These species upset the radiation balance of the planet and pollute the atmosphere that results in a negative impact on human health. The use of satellite data and evaluation of emission volumes released into the atmosphere due to wildfires on its basis ensures effective monitoring of vast and remote areas such as Northern Eurasia. Here a method taking into account burnt areas, biomass distribution density, biomass combustion efficiency and emission coefficients was used. All necessary information on sources of fire and burnt areas is provided by a system of satellite wildfire monitoring developed at the ISR «AEROCOSMOS». This system receives data from various satellites, registers thermal anomalies and picks out wildfires against other heat sources and natural noise. After processing of satellite data and using of additional software data, emission volume of trace gases and fine aerosols is calculated for the chosen area. The results of evaluation of emission volumes of trace gases and fine aerosols into the atmosphere of Northern Eurasia based on space-borne monitoring data is given for different months from 2010 to 2014.



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IGU2015 – 2693

**Assessment of the Biospheric Contribution to Surface Atmospheric CO2 Concentrations over East Asia with a Regional Chemical Transport Model**

Meigen ZHANG, Xingxia KOU, Zhen PENG, Yinghong WANG (China)

A regional chemical transport model, RAMS-CMAQ, was employed to assess the impacts of biosphere–atmosphere CO2 exchange on seasonal variations in atmospheric CO2 concentrations over East Asia. Simulated CO2 concentrations were compared with observations at 12 surface stations and the comparison showed they were generally in good agreement. Both observations and simulations suggested that surface CO2 over East Asia features a summertime trough due to biospheric absorption, while in some urban areas surface CO2 has a distinct summer peak, which could be attributed to the strong impact from anthropogenic emissions. Analysis of the model results indicated that biospheric fluxes and fossil-fuel emissions are comparably important in shaping spatial distributions of CO2 near the surface over East Asia. Biospheric flux plays an important role in the prevailing spatial pattern of CO2 enhancement and reduction on the synoptic scale due to the strong seasonality of biospheric CO2 flux. The elevation of CO2 levels by the biosphere during winter was found to be larger than 5 ppm in North China and Southeast China, and during summertime a significant depletion (≥ 7 ppm) occurred in most areas, except for the Indo-China Peninsula where positive bioflux values were found.



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IGU2015 – 1414

# Cold CO2 emission from sub-boreal soils: current trends and effect of repeating freezing-thawing events

Irina KURGANOVA, Valentin LOPES DE GERENYU, Tatiana MYAKSHINA, Dmitry SAPRONOV, Valery KUDEYAROV (Russian Federation)

Winter season can last in boreal and subboreal regions from 3 to 9 months, and hence winter CO2 emission (WECO2) is the important part in the total annual CO2 flux from soils in this area. In this study, the analysis of current climatic trends and anomalies for the winter time was carried out for southern part of Moscow region. It was found that the total changes in mean air temperature (WTair) for winter season (December-February) which corresponded to linear trend accounted for +1.63oC and -1.66oC during 1973-2011 and 1998-2011, respectively. Based on the 14-yr (1998-2011) monitoring of CO2 emission from soils in five various ecosystems located in the southern part of Moscow region, we estimated: (i) contribution of WECO2 to the total annual CO2 fluxes, (ii) the linear trends of WECO2, and (III) response of WECO2 to WTair anomalies. Winter season can contribute from 2.8 to 20.5% to the annual CO2 flux from soils depending on the ecosystem type (forest, grassland or cropland) and weather conditions of specific years. During 1998-2011 with negative WTair tendency, WECO2 demonstrated slight negative trend for sandy Albeluvisols (-9.6 ÷ -27.1 g C/m2/10yr) and slight positive tendency for clay Phaeozems (+1.3 ÷ +6.0 g C/m2/10yr). Both the extreme cold and extra warm winters induced the negative anomalies of seasonal WECO2, which averaged -53 and -28%. We observed the strong negative response of monthly WECO2 (mean anomaly -65%) to extreme low Tair in January and significant positive anomaly of WECO2 (42%) caused by extreme high Tair in December.



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**Observations and modeling of carbon fluxes from peatlands at Southern Taiga of Western Siberia**

Egor DYUKAREV, Eugenia GOLOVATSKAYA, Elena VERETENNIKOVA (Russian Federation)

Wetlands are integral components of landscapes with specific nutrient dynamics and carbon sequestration potential. Human modifications have the potential to significantly alter controls on carbon dynamics. This study focused on determining carbon balance of peatland ecosystems in Southern Taiga of Western Siberia. The primary types of oligotrophic and eutrophic ecosystems were studied, including pine-shrub-sphagnum ecosystem, open sedge-sphagnum fen, ridge-hollow complex, dwarf-shrub-sedge, sedge-dwarf-shrub, and pine-cedar-birch ecosystem. Carbon balance calculated from: emission of carbon dioxide and methane from peaty soils, net primary production (NPP), and carbon outflow with bog waters. Measurements of CO2 and CH4 emissions from peat surfaces were carried out bi-monthly in growing periods using infrared gas analyzer and chamber technique. Observations were accompanied by measurement of weather characteristics. The analysis of space images and ground data were used for vegetation classification and an estimation of the areas occupied by different ecosystems. Vegetation mapping and NDVI map analysis allows to estimate carbon balance for the key site and constructing maps of NPP, CO2 emission and carbon balance for studied peatlands.



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**Cognitive chaos: turbulence in the Earth system**

Sergej ZILITINKEVICH (Finland)

S.S. Zilitinkevich1-5 1Finnish Meteorological Institute, Helsinki, Finland 2Division of Atmospheric Sciences, University of Helsinki, Finland 3Department of Radio Physics, University of Nizhniy Novgorod, Russia 4Faculty of Geography, Moscow University, Russia 5Institute of Geography, Russian Academy of Sciences, Russia Turbulence is ever present in the atmosphere and ocean and performs the following vitally important "services": it transports energy, matter and momentum in the vertical throughout the fluid geospheres, and links the geospheres via strongly turbulent planetary boundary layers (PBLs) into interconnected climate-system and other Earth-systems. It is widely believed that in very stable stratifications, at Richardson numbers (Ri) exceeding the critical value Ric ~ 0.25, turbulence inevitably decays and the flow becomes laminar. This is so, indeed, in the low-Reynolds-number (Re) flows, e.g., in some laboratory experiments; but this is by no means always the case. Air flows in the free atmosphere and water currents in the ocean below the upper mixed layer are almost always turbulent in spite of the strongly supercritical stratifications, with typical values of Ri varying in the interval $10 < Ri < 102$. Until recently, this paradox has remained unexplained. We demonstrate that the key mechanism of the seemingly paradoxical self-preservation of the very-high-Re geophysical turbulence is the loop including (i) conversion of the turbulent kinetic energy unto turbulent potential energy and (ii) self-control of the negative (down-gradient) turbulent heat flux through efficient generation of the positive (counter-gradient) heat transfer by the turbulent potential energy (Zilitinkevich et al., 2007, 2008, 2009, 2013). Thanks to this loop, turbulence is maintained up to strongly supercritical stratifications. Moreover, at $Ri > Ric$ the familiar "strong-mixing turbulence" regime, typical of boundary-layer flows and characterised by the practically invariable turbulent Prandtl number TrP ~ 1 (the so-called "Reynolds analogy"), gives way to a previously unknown "wave-like turbulence" regime, wherein TrP sharply increases with increasing Ri (rather than to the laminar regime as is often the case in lab experiments). It is precisely the wave-like turbulence that dominates the free flows in the atmosphere and ocean. Modellers have long been aware that the turbulent heat transfer in the free atmosphere/ocean is much weaker than the momentum transfer. Our theory gives authentic formulation for this heuristic rule and provides physically grounded method for modelling geophysical turbulence up to very stable stratifications. Convective motions driven by the potential energy of unstable stratification develop over warm Earth surface or in clouds, and very efficiently transfer the heat, matter and



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momentum from the surface upward, thus preventing extreme air pollution and moderating heat waves. Conventional theory has treated convective mixing as usual turbulence. This approach gets in conflict with modern experimental evidence. Observations in nature, as well as large-eddy simulation (LES) and direct numerical simulation (DNS) of turbulent convection reveal large-scale self-organised cells and rolls, which behave like secondary circulations rather than turbulent eddies. Convective cells are known in viscous convection since Benard (1900) and Rayleigh (1916); but rolls, typical of the atmosphere and ocean, have no analogy in viscous convection. Rolls originate from the large-scale turbulent instability controlled by the non-gradient horizontal heart flux (Elperin et al, 2002, 2005). Self-organised convective motions are disregarded in classical theories, such as the heat/mass transfer law: Nu = 0.14 Ra1/3, the Monin-Obukhov similarity theory, etc. In the shear-free convection, convective cells involve the near-surface convective winds (towards the plume base), which generate mechanical turbulence and, thus, enhance the heat/mass transfer up to two orders of magnitude. References Zilitinkevich, S.S., Hunt, J.C.R., Grachev, A.A., Esau, I.N., Lalas, D.P., Akylas, E., Tombrou, M., Fairall, C.W., Fernando, H.J.S., Baklanov, and A., Joffre, S.M., 2006: The influence of large convective eddies on the surface layer turbulence. Quart. J. Roy. Met. Soc. 132, 1423-1456. Zilitinkevich, S., Esau, I. and Baklanov, A., 2007: Further comments on the equilibrium height of neutral and stable planetary boundary layers. Quart. J. Roy. Met. Soc. 133, 265-271. Zilitinkevich, S.S., Elperin, T., Kleeorin, N., Rogachevskii, I., Esau, I., Mauritsen, T., and Miles, M. W., 2008: Turbulence energetics in stably stratified geophysical flows: strong and weak mixing regimes. Quart. J. Roy. Met. Soc. 134, 793-799. Zilitinkevich, S.S., Elperin, T., Kleeorin, N., Rogachevskii, I., Esau, I.N., 2013: A hierarchy of energy- and flux-budget (EFB) turbulence closure models for stably stratified geophysical flows. Boundary-Layer Meteorol. 146, 341-373 Zilitinkevich S., Kulmala M., Esau I., Baklanov A., 2015: Megacities – refining models to personal environment. WMO Bulletin 64 (1), 20-22.



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## Web-GIS based virtual research environment for Northern Eurasia climatic studies

Evgeny GORDOV, V.N. LYKOSOV, V.N. KRUPCHATNIKOV (Russian Federation)

Volumes of environmental data archives are growing immensely due to recent models, high performance computers and sensors development as well as due to initiation of a set of large scale complex global and regional climatic studies. It makes impossible their comprehensive analysis in conventional manner on workplace using in house computing facilities, data storage and processing software at hands. One of possible answers to this challenge is creation of virtual research environment (VRE), which should provide a researcher with an integrated access to huge data resources, tools and services across disciplines and user communities and enable researchers to process structured and qualitative data in virtual workspaces. VRE should integrate data, network and computing resources providing interdisciplinary climatic research community with opportunity to get profound understanding of ongoing and possible future climatic changes and their consequences. Presented are first steps and plans for development of virtual research environment prototype as an element of future environmental VRE aimed at regional climatic and ecological monitoring and modeling as well as at continuous education and training support.



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## Satellite and ground based measurements: comparison of CO and CH4 total contents for background and polluted conditions

Vadim RAKITIN, N. ELANSKY, A. SKOROKHOD, Yu. SHTABKIN, N. PANKRATOVA, A. SAFRONOV, A. DZHOLA
(Russian Federation)

Previous validation results of IASI and AIRS CH4 and CO, MOPITT CO satellite data with some ground-based solar spectrometers located background and industrial regions are presented. Comparison was produced for time-period 2010-2014 years for different periods of averaging from diurnal data to monthly averaged means. Also the results of comparison of these satellite sensors data between each other have presented. Good agreement in main ground-based and orbital AIRS TC for CH4 (R2~0.4-0.8), for CO (R2~0.6-0.9) for background conditions (without anthropogenic emissions and emissions from wild fires), for diurnal TC 1°x1° and 5°x5° domains averaged was found. Similar results were obtained for MOPITT CO TC. For "strong emissions" conditions (such as Beijing region and regions of wild fires) were found R2~0.2-0.7 and another characters of relations between satellite and ground-based CO TC diurnal data. Excluding days with low ABL Heght (H≤0.7 km) allows obtain higher correlations coefficients. Long-term variation characteristics of CH4 and CO columns for different background Eurasian sites and regions for both ground-based and orbital sensors are discussed. CH4 TC increased in middle and a high altitudes of Eurasia with the rate of 0.2-0.35 %/y during 2010-2014 time period correspondently AIRS data. CO TK in Polar Regions hasn't increased. Present work was supported by the Russian Scientific Fund under grant 14-47-00049



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**Background CO and CH4 total contents: long-term IAP spectroscopic datasets, typical and abnormal variations and temporal tendencies**

Eugeny GRECHKO, A. DZHOLA, V. RAKITIN (Russian Federation)

The results of regular ground-based spectroscopic measurements of CO and CH4 atmospheric total content (TC) in Zvenigorod (ZSS station, Moscow region, 53 km west from the center of Moscow) and the station ZOTTO (Central Siberia). For ZSS the longest in the world measuring data-set of these impurities TC (from 1970 for CO and from 1974 to present for CH4) was analyzed. Several characteristic periods of interannual variations of total CO at ZSS are highlighted: an increase in the 70-80s of last century (1.8%/year), the stabilization in the 80s and a significant decrease since 2001 (2.5-3%/year). The influence of the Moscow metropolis on the CO content at the ZSS was small (Moscow's influence leads to a 10% increase in background columns less than at 5 % of all ZSS measurements number). CH4 content on ZSS increased during the whole observation period (0.5 % / year in 1974-2014). The variations of CO in the Moscow region (site ZSS) during the wildfires of summer 2010 and in Central Siberia (station ZOTTO) during the forest fires of 2011 and 2012 were Investigated. It's found that the total content of CO during these episodes of abnormal disturbances exceed 2-5 times the typical background TC. Also some results of validation satellite and ground-based spectrometers for background conditions and diurnal means of CO and CH2 TC are presented. This work was supported by the Russian Foundation for Basic Research (grants № 14-05-91160, 13-05-41395 and 14-05-93089).



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IGU2015 – 4160

**Towards the harmonized PEEX project observational infrastructure: Building the metadatabase**

Pavel ALEKSEYCHIK, Hanna LAPPALAINEN, J. KUJANSUU, Tuukka PETÄJÄ (Finland); Nina ZAYTSEVA (Russian Federation)

Pan-Eurasian Experiment (PEEX) is a joint multinational initiative in climate and environmental studies over the Eurasian continent (Kulmala et al. 2011, Lappalainen et al. 2014). The focus areas include the establishment of a coherent research infrastructure, forecasting the effects of the climate change and developing mitigation strategies for the Northern states. The infrastructure aspect of the project has a high priority as the foundation of all future activities. To address this task, the PEEX metadatabase was founded. The metadatabase summarizes the observational facilities included in PEEX and provides details about their organization, measurement equipment and a number of other features. The number of PEEX sites currently included in the metadatabase is 284. The preliminary version of the PEEX metadatabase already provides information on the PEEX observational infrastructure, with a possibility to identify the areas of higher/lower infrastructure development, or assess the density of a particular measurement type across the PEEX domain.



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IGU2015 – 0835

# Paradox of the surface air cooling in response to the global warming: A role of the stably stratified PBL and free atmosphere temperature inversions

Igor EZAU (Norway)

The intuitive conception of warming assumes that heating of a water or air layer will result in corresponding rise of its temperature. However, this conception cannot be applied straightforward to a thin turbulent layer – the planetary boundary layer (PBL) – at the air-water or the air-land interface as the PBL may expand in response to the heating. This expansion involves additional air/water from the adjacent layers, and therefore, will damp the temperature rise or even reverse it. Indeed, in a simple energy balance model $\Delta T(t)=Q(t)/h(t)$ ^ where Q is the applied heating and h is the thickness of the mixed layer. The heating Q>0 always result in rising temperature but this rise could be slower than it used to in response on the certain heating perturbation, δQ. The temperature anomaly, δT(t), at time t will be then negative. The heating in the climate system is fluctuating at high (diurnal) frequency. The condition δT<0 would mean that the temperature warms less during the diurnal cycle despite the systematic heating increase δQ>0. Such a paradoxical anti-correlation between δT and δQ will be observed when $h/Q<\delta h/\delta Q$ (1) where δh is the corresponding perturbation in the PBL thickness. In the idealized convective PBL where h(t)=f(Q(t),t), the condition in Eq. (1) are not satisfied. However, it is well established now that h is a function of numerous other control parameters, specifically it is controlled by the local imposed stratification of the free atmosphere, the non-local advection in the mid-tropospere and large-scale air subsidence/water upwelling. The possibility of the PBL temperature decrease in response on additional heating has been identified PBL in Esau (2008) but regarded to be a marginal effect. The recent analysis of observational data from FLUXNET (Luyssaert, et al., 2014) has revealed that the regimes of active mixed layer expansion, which lead to the layer cooling in response to heating, are much more common than it has been previously thought. Here, we review the theoretical constrains on such paradoxical regimes and construct their climatology in the state-of-the-art reanalysis data. References. Esau, I, 2008: Formulation of the Planetary Boundary Layer Feedback in the Earth's Climate System, Computational Technologies, 13, special issue 3, 95-103 Luyssaert S, Jammet M, Stoy PC, et al. 2014: Land management and land cover change have impacts of similar magnitude on surface temperature. Nature Climate Change, 4, doi: 10.1038/nclimate2196



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# Temporal and spatial variability of biologically active UV radiation and UV resources over northern Eurasia

Natalia CHUBAROVA, Ekaterina ZHDANOVA (Russian Federation)

UV radiation causes a significant influence on human health and nature ( UNEP, 2011). Recently a new approach has been developed, which allows a user to estimate different kinds of biologically active UV radiation (vitamin D, eye damage, erythema) using an accurate radiative transfer model based on 8-stream discrete ordinate method over the territory of Northern Eurasia and to characterize their favourable or detrimental effects on people health ( Zhdanova, Chubarova, 2013). The simulations have been fulfilled for real climatological fields of aerosol, ozone, surface albedo and cloudiness with 1x1 degree resolution. A new method was recently developed for estimating the threshold on harmful effects of eye damaging UV radiation. Its application in the UV calculated scheme has revealed significant (50%) reduction of the area with UV optimum conditions in some months of the year (April, May). In addition, a new altitude UV parameterization has been developed, which accounts not only for the changes in atmospheric pressure but also for aerosol and surface albedo variations. This provides more rigorous estimates of UV irradiance and UV resources at a particular location in mountainous regions, where one degree resolution is not acceptable. All the methods were incorporated in the interactive program available via www.momsu.ru/uv/, which allows a user to calculate the UV effects over a particular point at the territory of Northern Eurasia. A special attention is paid to long-term variability of biologically-active UV radiation. Using satellite and ground-based measurements as well as UV reconstruction model we analyzed temporal variability of biologically active UV radiation on the example of Moscow region. The application of the UV reconstruction model provides the assessment of the role of different atmospheric factors in UV variability and their possible connection with global processes. References: UNEP, Environmental Effects of Ozone Depletion and its Interactions with Climate Change: 2010 Assessment. United Nations Environment Programme, ISBN 92-807-2312-X, 2011 Chubarova N. and Zhdanova Ye. Ultraviolet resources over Northern Eurasia. – J. Photochemistry and Photobiology B: Biology, Elsevier BV (Netherlands), 2013, vol. 127, pp. 38-51.



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IGU2015 – 2941

**Investigation of atmospheric composition using ground-based methods in cloudy conditions at Russian-Belorussian DOAS Network**

Oleg POSTYLYAKOV, M.S. ANDREEV, A.S. ELOKHOV, A.P. MEDVEDEV, A.I. CHULICHKOV, S.K. BORODKO, A.N. BOROVSKI, I.I. BRUCHKOUSKI, V.A. IVANOV, A.N. KRASOUSKI, A.G. SVETASHEV (Russian Federation)

Investigation of composition of the atmospheric boundary layer (ABL) is much more complicated during cloudy conditions from both the Earth ground and satellites. Opportunity to determine trace gas integral content in ABL at clear-sky and cloudy conditions using ground-based DOAS measurements of scattered solar radiation is analyzed. Analysis is performed for determination of the nitrogen dioxide and formaldehyde integral content in ABL. Based on measurements during clear-sky conditions we propose to calibrate used DOAS spectrometer. The calibration includes determination of 1) the spectrometer constant of the absolute radiative calibration, 2) the spectral sensitivity of the spectrometer and 3) integral gas column in the DOAS reference spectra. Basing on the calibrations an existence and several important optical characteristics of clouds are estimated. In addition, two spaced digital photo cameras take pictures of the sky during gas content measurements. This allows to determinate cloud base height in the moment of observation. We propose a method of estimation of gases content using obtained cloud characteristics. Error analysis of the method is performed. The research was partially supported by RFBR grant 14-05-90012 and BRFBR grant X14P-135. 1. V.A.Ivanov, O.V.Postylyakov. Estimation of integral NO2 content in atmospheric boundary layer using observations of scattered in zenith radiation. Atmos. and Ocean. Optics, 2010, 23, #6, 471-475 (in Russian). 2. O.V. Postylyakov, A.N. Borovski. Measurements of formaldehyde total content using DOAS technique: a new retrieval method for overcast. Proc. of SPIE Vol. 9259, 925918.1-7, 2014, doi: 10.1117/12.2069595. 3. M.S. Andreev, A.I. Chulichkov, A.S. Emilenko, A.P. Medvedev, O.V. Postylyakov. Estimation of cloud height using ground-based stereophotography: Methods, error analysis and validation. Proc. of SPIE Vol. 9259, 92590N.1-6, 2014, doi: 10.1117/12.2069800.



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IGU2015 – 4231

**Biogenic Aerosols - Effects on Clouds and Climate (BAECC) project as a showcase for benefits of comprehensive atmospheric observations**

Tuukka PETAJA, K. ATLASKINA, A.J. MANNINEN, E.O. CONNOR, D. MOISSEEV, V. SiNCLAIR, H.K. LAPPALAINEN, M. KULMALA, V.-M. KERMINEN (Finland)

Boreal forests, situated in a circumpolar belt in the Northern latitudes throughout the United States, Canada, Russia and Scandinavia, are, of all biomes, among the most active areas of atmospheric aerosol formation. The formation of aerosol particles and their growth to cloud condensation nuclei sizes in these areas are associated with biogenic volatile organic emissions from vegetation and soil. One of the world's most comprehensive observation sites in a boreal forest environment, measuring atmospheric aerosols, biogenic emissions and an extensive suite of relevant atmosphere-biosphere parameters, is SMEAR-II (Station for Measuring Forest Ecosystem-Atmosphere Relations, Hari and Kulmala (2005)) in Hyytiälä, Finland. To capture the vertical and spatial variability of aerosol particles and clouds, the U.S. DoE's Atmospheric Radiation Measurement (ARM) Program operated ARM Mobile Facility 2 (AMF2) in Hyytiälä. "The Biogenic Aerosols - Effects on Clouds and Climate (BAECC) experiment (Petäjä, 2013) lasted for 8.5 months in 2014. The BAECC provides a bridge from an 18-year long SMEAR-II observation record to the impact of biogenic aerosol on clouds, precipitation and climate. This will be achieved by simultaneous observations of precursor vapor emission, aerosol, cloud, and precipitation microstructure. With this dataset we: (1) link precursor emissions and aerosol, (2) link aerosol at the surface to aerosol in the mixing layer and free troposphere, (3) investigate the aerosol indirect effects on clouds and precipitation.



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IGU2015 – 2358

**Black carbon studies in the atmosphere over the White, Barents, Greenland and Kara seas during the summer 2014**

Vladimir SHEVCHENKO, V.M. KOPEIKIN, I.A. GOVORINA, M.S. MAKHOTIN, A.N. NOVIGATSKY (Russian Federation)

The distribution of black carbon (BC) in the atmosphere in marine boundary layer in the White, Barents and Greenland seas was studied from 1 to 27 June, 2014 and in the White, Barents and Kara seas from 31 July to 20 August 2014 during cruises of the RV "Professor Molchanov". Air was filtered through filters AFA-KhP (perchlorovinyl fibers). The mass of BC on the filter is determined by measurement of the attenuation of a beam of light transmitted through the filter. In June 2014 BC concentrations varied from 4 to 570 ng/m3 (167 ng/m3 in average, N = 42 samples), in August 2014 – from 10 to 1120 ng/m3 (260 ng/m3 in average, N = 42 samples). In the most part of samples the BC concentrations were relatively low corresponding to background level for Arctic seas in summer. Construction of backward trajectories of air masses using the HYSPLIT program (http://www.arl.noaa.gov/ready/hysplit4.html) demonstrated that air masses arrived to the sampling areas from the Central Arctic mostly. BC concentrations were higher near the Arkhangelsk. The authors are thankful to A.P. Lisitzin for support, the crew of the RV "Professor Molchanov", E.Yu. Churakova and students of the Northern (Arctic) Federal University for help in expeditions. Our studies were supported by RFBR (projects 14-05-93089, 14-05-00059), Presidium of Russian Academy of Sciences (Program 44 of Fundamental Research).



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IGU2015 – 3302

**Evaluation of convective boundary layer parameterizations based on LES data**

Andrey DEBOLSKIY, V.STEPANENKO (Russian Federation)

Convective internal boundary layers (CBLs) develop over polynas and leads and during cold-air outbreak events over ice-open water edge in the Arctic region throughout a year. These boundary layers contribute significantly to an overall Arctic surface heat balance. Therefore it's crucial to represent CBLs precisely in numerical weather prediction and global climate models. However, they still cannot be resolved explicitly on these models' grids, so their impact must be parameterized. The first analytic solutions for CBL growth over time was presented almost 80 years ago (Zubov 1945), since then a wide range of parameterizations were developed. This study is aimed to evaluate the most recent of them (e.g. Zilitinkevich et al. 2012) and their performance over a variety of different background flow conditions by comparison to Large Eddy Simulation (LES) results. Those parameterizations are based on a bunch of assumptions such as linearity of heat flux with height, horizontal homogeneity of buoyancy inside CBL, etc. The validation of these assumptions under different background flow and surface conditions and an assessment of respective errors in CBL parameters are presented. LES data obtain with Large Eddy Simulation model developed in Institute of Numerical Mathematics of Russian Academy of Science (LES INM RAS). N. N. Zubov, Arctic Ice (Izd. Glavsevmorputi, Moscow, 1945) [in Russian]. S. S. Zilitinkevich et al. (Izvestiya, Atmospheric and Oceanic Physics, 2012) Vol. 48, No. 1, pp. 133–142.



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IGU2015 – 4233

# A GPP assimilation model in southeastern Tibetan Plateau coupled CO2 eddy covariance flux tower and remote sensing information

Jiahua ZHANG, Yan JIANG (China (Beijing))

The gross primary production (GPP) at individual CO2 eddy covariance flux tower sites (GPPTower) around the southeastern Tibetan Plateau were determined by the net ecosystem exchange of CO2 (NEE) and ecosystem respiration (Re). The satellite remote sensing-VPM model estimates of GPP values (GPPMODIS) used the satellite-derived 8-day surface reflectance product, including satellite-derived enhanced vegetation index (EVI) and land surface water index (LSWI). In this paper, we assembled a subset of flux tower data at three sites to calibrate and test satellite-VPM model estimated GPPMODIS, and introduced the satellite data and site-level environmental factors to develop four new assimilation models. The new assimilation models' estimates of GPP values were compared with GPPMODIS and GPPTower, and the final optimum model among the four assimilation models was determined and used to calibrate GPPMODIS. The results showed that the assimilation models' estimates of GPP values (GPPMODEL) were much more closer to GPPTower with RE approximately 6.98% than that of GPPMODIS, indicating that the capacity of the simulation in the new assimilation model was greatly improved, the R2 and root mean square error (RMSE) of the new assimilation model were 0.57–4.90% higher and 0.74–2.47 g C m−2 s−1 lower than those of the GPPMODIS, respectively. The assimilation model was used to predicted GPP dynamics around the Tibetan Plateau and showed a reliable result. This study demonstrated the potential of the new assimilation model for estimating GPP around the Tibetan Plateau and the performances of site-level biophysical parameters in related to satellite-VPM model GPP.



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IGU2015 –4254

**Aircraft-borne measurements over Southern Finland during the PEGASOS 2013 campaign**

Riikka VÄÄNÄNEN, R. KREJCI, H. E. MANNINEN, T. NIEMINEN, T. YLI-JUUTI, J. KANGASLUOMA, T. POHJA, P. P. AALTO, T. PETÄJÄ, M. KULMALA (Finland)

To study the role and processes of the atmospheric aerosol, both on-ground and airborne measurements are needed. University of Helsinki has performed campaigns by light aircraft since 2009 extend the aerosol measurements into the lower troposphere. The research flights in 2013 were a part of the PEGASOS 'Northern Mission' campaign and supported the measurements performed by Zeppelin NT airship. The goals of the measurements were to quantify the vertical aerosol distributions up to the altitude of 3.5 km, and to study the vertical extend of the new particle formation (NPF) and how it is linked to the planetary boundary layer evolution.A Cessna 172 aircraft was used as a measurement platform. The total aerosol concentration with a cut-off size of 3 nm, particle size distribution in the 10-300 nm range, H2O/CO2 concentrations as well as basic metrological quantities were measured. Most of the research flights were flown in the vicinity of SMEAR II station between April and June, 2013. Simultaneously, in addition to the continuous measurements, an extensive field campaign was performed on-ground at SMEAR II station to measure aerosol and gas properties in atmosphere. Majority of the NPF events during the PEGASOS campaign were classified into the so called "class 2" category, which means that the growth of the particles was not observed as continuous on ground. On several days, we found that within an hour around the NPF event was observed on ground, there was a clearly larger concentration of particles with diameters of 3–10nm at the top of the boundary layer than at ground level. This could indicate that the NPF event starts at the top of the boundary layer. However, more analysis will be needed to separate the horizontal inhomogeneity from the vertical variation.



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**Verification of Aerosol Diffusion Spectrometer on the measurement of atmospheric aerosol particles**

Xuemeng CHEN, S. DUBTSOV, H. E. MANNINEN, T. NIEMINEN, P. AALTO, T. PETÄJÄ, M. KULMALA (Finland)

The number size distribution of ambient aerosol particles spans over wide size and concentration ranges1. The characterisation of these atmospheric aerosol particles typically requires a combination of various instruments and techniques. The performances of devices developed from different physical bases need intercomparison to ensure the reliability of the measurement data and the corresponding interpretation. During a field campaign (April 29 - May 15, 2013) at the Station for Measuring Ecosystem – Atmosphere Relations (SMEAR II) in Hyytiälä, southern Finland2, an Aerosol Diffusion Spectrometer (ADS) was intercompared with a Differential Mobility Particle Sizer (DMPS) and a Neutral cluster and Air Ion Spectrometer (NAIS). The ADS provided comparable number size distribution of ambient aerosol particles in the size range of 3- 200 nm to the DMPS and the NAIS results. Good agreements were obtained on the new particle event (NPF) days, though some differences were observed between condensation sinks derived from the ADS and the DMPS data. The DMPS, the NAIS and the ADS provided similar formation rates and growth rates manifesting the suitability of the ADS for the ambient measurement of aerosol particles, especially for nucleation mode particles during NPF. 1. Poschl, U., Angew. Chem. Int. Ed. Engl., 2005. 44(46): p. 7520-40. 2. Hari, P. and Kulmala, M., Boreal Env. Res., 2005. 10: p. 315-322.



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IGU2015 – 1340

**An interactive tool for calculations of UV doses and UV resources.**

Ekaterina ZHDANOVA, Natalia CHUBAROVA (Russian Federation)

UV radiation has a considerable impact on human health by means of erythema formation (the main negative effect) and vitamin D synthesis (the main positive effect) via skin. A special interactive tool has been developed for estimating UV resources over the territory of Northern Eurasia. UV resources are determined using the estimates of two kinds of biologically active irradiance. UV-resources were classified as 100-% UV-deficiency, noon UV-deficiency, UV-optimum and several levels of UV-excess. The tool represents client-server application. The client part is the web-page with the form for input parameters required for erythemal UV doses calculations. The server part includes the web-server and CGI-script , which receives input parameters, performs calculations and returns the results. To calculate erythemal UV doses special tables (LUT) have been created. These LUT provide erythemal UV irradiance at the earth surface in cloudless conditions depending on solar zenith angle (SZA), total ozone content (TOC) and aerosol optical thickness at 380 nm wavelength (AOT380). The tables have been calculated using a one-dimensional radiation transfer model (TUV) by discrete ordinates method (DISORT) in 8-stream approximation. The developed tool allows a user to estimate erythemal UV dose and its effects on people's health with different skin types in a given geographic location and specified time, based on information about intrinsic parameters influenced on UV radiation (total ozone content, cloud transmittance, surface albedo, aerosol optical thickness). Also altitude dependence of TOC, AOT380 and albedo effect were included in the calculation scheme. The tool considers open human body fraction, which is important for assessing efficiency of UV radiation for vitamin D synthesis. Erythemal UV doses in average climatic conditions or in conditions specified by the user can be obtained. Interactive-tool is freely available at http://momsu.ru/uv/.



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IGU2015 – 1392

**Long-term variability of UV radiation in 300-380 nm spectral regionin Moscow according to long-term measurements and reconstruction model**

Yelena NEZVAL', Natalia CHUBAROVA (Russian Federation)

UV monitoring at the Meteorological Observatory of Moscow State University (MO MSU) provides the longest UV time series within the spectral range of 300-380nm since 1968 by different kinds of UV – instruments, which are calibrated against the European standards. In this presentation we discuss seasonal and interannual UV variability and its reasons in Moscow according to 1968-2014 period of observations. The ratio of diffuse to global UV irradiance is analyzed for different seasons of the year: it changes from 96-99% in winter to 78-80% in summer conditions. The ratio of global UV irradiance 300-380nm to total radiation is about 4% and does not change significantly over the analyzed period. Special attention is paid to the effects of different geophysical factors influencing the UV irradiance at ground. We analyze the effects of cloudiness, aerosols and surface albedo on the level of UV irradiance 300-380nm. On average, the lowest losses due to cloudiness of about 23-27% are observed from May to August. Maximum losses (up to 44%) are in October-November. Changes in the global UV irradiance due to natural fluctuations of aerosol can reach 30-35% at the solar elevation h = 10° and 20-25% at h = 55° . In cloudless conditions, the snow cover increases global UV radiation by 8-12 % and is significantly enhanced in the presence of clouds. In order to reveal the reasons of year-to-year variability a special UV reconstruction model has been applied over the whole period of UV observations(Chubarova, ACP, 2008). We show that the changes in the effective cloud transmission plays the most important role in interannual UV variations (about plus-minus 8-10%). Variability of total ozone does not play a significant role since the effective wavelength of the UV irradiance 300-380nm is out of strong ozone absorption. The role of interannual UV variations due to changes in aerosol properties can also be seen but it is substantially smaller than the effects of cloudiness. However, the existing long-term decrease in aerosol loading leads to the increase of UV irradiance 300-380nm. References: Chubarova N.E., UV variability in Moscow according to long-term UV measurements and reconstruction model. Atmos. Chem. Phys., 8, 2008, pp. 3025-3031



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IGU2015 – 1403

**Black Carbon Atmospheric Emissions From Russian Oil/Gas Industry Open Fires**

Anna VINOGRADOVA (Russian Federation)

Black carbon (BC) is one of so-called SLCFs (Short Lived Climate Forcers). Now information on BC in the atmosphere and on the snow is of importance for climate modeling. Atmosphere is the quick way for impurity to reach distant area, particularly the Arctic. A lot of anthropogenic pollutants in the Arctic atmosphere come from Russian territory. Unfortunately, Russian BC atmospheric emissions are still known with great uncertainty. During last years, oil/gas industry moving to the north entered accompanying open fires on the list of the main atmospheric BC sources for the Arctic region. This work aims to compute BC atmospheric emissions from open fires situated on sub-Arctic Russian territory. The basic data on atmospheric emissions from towns and regions are from the official Russian statistics of Roshydromet (Reports of "Scientific Research Institute for atmospheric air protection" [http://nii-atmosphere.ru/]) for 2010. The previous estimates for Russian BC anthropogenic emissions and their distribution through RF territory with grid cells (1°×1°) were based on carbon oxide emissions values [1]. These results for Yamalo-Nenetsky and Khanty-Mansiisky autonomous okrugs jointly with satellite visual data are used to estimate the open fire emissions and their distribution on grid cells. The annual fire emission is estimated as (25±10) kt, which is (7-15)% of the total Russian anthropogenic BC emission. The work is supported by RFBR (grant 14-05-93089).



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# Impact of freezing events of different intensity on CO2 fluxes from temperate soils: the results of manipulation experiment

Valentin LOPES DE GERENYU, Dmitriy KHOROSHAEV, Irina KURGANOVA, Evgeniya BLAGODATSKAYA
(Russian Federation)

The current climatic prognosis for European Russia predicts both the increase of repeatability of soil freezing-thawing and prolongation of period when soil remains unfrozen. This study was aimed to evaluate the effect of freezing events of different intensity on CO2 fluxes from soils. The manipulation experiment with regulated snow cover depth was established in grassland cenosis and bare soil (Luvisols Haplic, Moscow region, 54o50'N, 37o36'E; continental-temperate climate). The following winter scenarios were foreseen: (1) control, CL with natural depth of snow cover, (2) deep freezing, DeFr (without snow cover), and (3) exclusion of freeze, ExFr (simulation of deep snow cover by artificial heat insulation material). CO2 emission flux (total soil respiration, TSR) was measured by closed chamber method 2-3 times per week from late October, 2014 to early February, 2015. The cumulative TSR flux from grassland plots during 3.5 months of field observations varied between 34.7-44.0 g C/m2 (CL and DeFr plots) and 111.7 g C/m2 in ExFr variant. For the bare plots, TSR fluxes were 1.3-2.1 times less in comparison with grassland soil. The rate of CO2 emission from frozen soils was very low and comprised 0.14-0.20 and 0.22-0.24 g C/m2/day for bare and grassland plots, respectively. During the thawing periods, TSR rate has increased 1.6-2.9 times depending on treatment. We conclude that under temperate climate the freezing events play an important role reducing significantly (more than 2-2.5 times) winter CO2 emission fluxes from soils.



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**Drought effect on CO2 fluxes from temperate soils: the results of precipitation manipulation experiment**

Irina KURGANOVA, Valentin LOPES DE GERENYU, Dmitry KHOROSHAEV, Evgenia BLAGODATSKAYA
(Russian Federation)

According to prognosis, the climate change in Central Russia is likely to increase both intensity and frequency of droughts. This study was aimed to evaluate the effect of severe and repeating moderate summer droughts on CO2 fluxes from soils. The manipulation experiment for excluding rainfall (12 roofed plots) was established in grassland cenosis and bare soil (Luvisols Haplic, Moscow region, 54o50'N, 37o36'E; continental-temperate climate). The following precipitation patterns were foreseen: (1) control, CL with optimal moisture regime (98 mm per 3 months), (2) repeating short droughts, RDR (30 and 48 days without rainfall), and (3) severe drought, SDR (82 days without rainfall). The water losses were compensated at the end of each drought to simulate heavy rain events (15-55 mm). CO2 emission flux (total soil respiration, TSR) was measured by closed chamber method 2-3 times per week using Li-COR 6400. The TSR during 3 months of manipulation experiment averaged at 169 and 128 g C/m2 in control grassland and bare plots, respectively. Severe drought stress reduced the TSR by 30% (grassland) and by 10% (bare soil). The impact of drought stress intensity on the TSR was insignificant both under grasses and in bare plots. Despite a significant increase of SR after excessive wetting of soils at the completion of droughts, the CO2 emission bursts had a small impact (2-10%) on the summer TSR from soils. We conclude that under temperate climate the TSR is regulated mainly by total duration of summer drought while the affect frequency of rainfall events was weaker.



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IGU2015 – 1294

**Methane Emissions From Northern Lakes In Karelia And Western Siberia**

Leonid GOLUBYATNIKOV (Russian Federation)

Among the natural sources of methane, lakes (whose total area is about 3% of the surface area of the continents) are second in intensity of its emission into the atmosphere. We have analyzed the experimental data on methane fluxes from boreal lakes in northern Karelia and tundra lakes in Western Siberia. Flux measurements were made during summers of 2009, 2010, 2013 and 2014 in Western Siberia and autumn of 2014 in Karelia. We used static chambers with base size of 40x40 cm and height of 30 cm floated on water surface. Each observation included 4 samples in a 8-10 minute time step. Methane concentration in samples was determined with the GC-FID. On the basis of experimental data we obtained that over the warm season the average methane flux into the atmosphere from tundra lakes in Western Siberia changed from 0.2 to 3.5 mgCH4/m2 per hour, the average methane emission from boreal lakes in northern Karelia – from 0.01 to 0.8 mgCH4/m2 per hour. This work was supported by the Russian Foundation of Basic Research (projects 14-05-00193, 14-05-91764) and the Basic Research Program (Department of Earth Sciences, Russian Academy of Sciences) "Impact of Modern Climate Change and Environmental on Processes in Atmosphere and Cryosphere".



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IGU2015 – 0833

# Long-term variability of aerosols in Moscow according to AERONET, their radiation effects and comparison with the results of radiative calculations in COSMO-Ru mesoscale model

A.A. Polyukhov, N.E. Chubarova, G.S. Rivin, M.V. Shatunova (Russian Federation)

Aerosol has a significant impact on solar radiation, and thus may affect the meteorological conditions and the quality of the weather forecast. In Moscow, the AERONET program of aerosol monitoring has been in operation at the Meteorological Observatory of Moscow State University (MSU MO) since 2001 [1].The objective of the study was to obtain the estimates of seasonal and interannual variability of aerosol properties and their radiative effects, as well as to perform numerical experiments for assessing the influence of aerosol on the weather forecast in mesoscale model COSMO-Ru2. During the 2001 - 2013 period a significant (20%) aerosol optical depth decrease was obtained, especially in UV and visible spectral range. Particular attention was paid to interannual variations of the fine-mode aerosol fraction, which was estimated by two methods. The main algorithm is the retrieval of microphysical and optical properties of aerosols according to the direct and diffuse radiation, proposed by Dubovik, King [2]. Another algorithm is the algorithm proposed by O'Neill [3]. The application of both methods has revealed a significant decrease of fine-mode aerosol during last years. Variability of other aerosol properties of the atmosphere over this period is also analyzed. The estimates of the aerosol radiative effect at the low and upper boundary of the atmosphere under various atmospheric parameters, including different surface albedo, were obtained for Moscow conditions. These results are compared with the measurements by CNR4 Kipp & Zonen instrument, which currently is being in operation at the MSU MO. In addition, for several cases with large and small aerosol loading the comparisons were made between the measurements of shortwave and longwave radiation by CNR4 instrument at the MSU MO and the radiative simulations [4], which has been implemented in the mesoscale COSMO-Ru2 model [5,6]. A series of numerical experiments for evaluating the effects of aerosol on the quality of weather forecast were performed. References: 1. Chubarova N., Smirnov A., Holben B.N.: Aerosol properties in Moscow according to 10 years of AERONET measurements at the Meteorological Observatory of Moscow State University // Geography, Environment, Sustainability, 4, 1, 19-32, 2011 2. Dubovik, O., A. Smirnov, B. N. Holben, M. D. King, Y.J. Kaufman, T. F. Eck, and I. Slutsker, 2000: Accuracy assessments of aerosol optical properties retrieved from AERONET sun and sky-radiance measurements, J. Geophys. Res.,v. 105, p. 9791-9806. 3. O'Neill, N. T., O. Dubovik, and T. F. Eck, 2001: A modified Angstrom coefficient for the characterization of sub-micron aerosols, App. Opt., v. 40, No.14, p. 2368 –2375. 4. Ritter B., Geleyn J.-F. 1992: A Comprehensive Radiation Scheme for Numerical Weather Prediction Model with Potential Applications in Climate Simulations, Mon.Wea. Rev., v.120, p. 303–325. 5. Vilfand R.M., Rivin G.S., Rozinkina I.A. 2010: Mesoscale weather short-range forecasting at the Hydrometcenter of Russia, on the example of COSMO-Ru. Russian Meteorology and Hydrology, v. 35, No.1, p. 1–9. 6. Vilfand R.M., Rivin G.S., Rozinkina I.A. 2010: COSMO-Ru system of nonhydrostatic mesoscale short-range weather forecast of the Hydrometcenter of Russia: the first stage of realization and development. Russian Meteorology and Hydrology, v. 35,No. 8, p. 503–514.



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## Optical properties of Lake Vendyurskoe

Galina GAVRILENKO, Roman ZDOROVENOV, G. ZDOROVENNOVA, N. PALSHIN, T. EFREMOVA, S.GOLOSOV, A. TERZHEVIK (Russian Federation)

The optical properties of Lake Vendyurskoe (Russia, 62°10N, 33°10'E, ) were investigated during eight surveys (2012-2014). Lake Vendyurskoe is a mesotrophic polymictic shallow lake of glacial origin (surface area 10.4 km2, volume 54.8•106 m3, maximal and average depths 13.4 and 5.3 m, respectively). The observational data consist of the water temperature, downwelling and upwelling planar irradiances at the surface of water and ice, downwelling planar irradiance beneath the ice, photosynthetically active radiation (PAR) at different depths under the ice or water surface down to 7.2 m, and Secchi disc depth. The data was obtained with use of the following equipment: temperature sensor TR-1060 (RBR Ltd., Canada), star-shaped pyranometer (Theodor Friderich & Co, Meteorologishe Gerate und Systeme, Germany), and Ultra-miniature Light Intensity Recorder (Alec electronics, Japan). The PAR vertical profiles show maximum value in 0-1 m depth and rapid decrease to zero in 3.5-5 m depth. The maximum value was marked in the end of April-early May. The attenuation coefficients reach maximum 1.5-2.5 m-1 in 0-1 m depth and minimum 0.5-1 m-1 in 3-4 m. The Secchi disc depth ranged 2.7–3.7. The study is supported by the RFBR (projects 13-05-00338, 14-05-91761, 14-05-00787) and by EC (grant Marie Curie IRSES: GHG-LAKE № 612642).



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# Russia and Canada in the Northern Dimension

## Russia and Canada in the Northern Dimension: Indigenous People

**Chairperson(s):** *Tatyana KRASOVSKAYA, Anastasia LOMAKINA*

- The Kets Ethnos And Its "Feeding Landscape": Ecological-Geographical And Socio-Ecological Problems Under Globalization And Changing Climate

  *Alexey MEDVEDKOV (Russian Federation)*

- Role of Institutions in Building Resilience in Single Industry Towns in the Russian North

  *Julia LOGINOVA (Australia)*

- Measuring Prospects for Ethno-cultural and Demographic Sustainability of Indigenous Village Communities

  *Anatoly YAMSKOV (Russian Federation)*

- Cultural landscapes of indigenous population of the Russian Arctic as national heritage

  *Tatiana KRASOVSKAYA (Russian Federation)*

- Russian Sami in a changing world

  *Ekaterina MAKAROVA (Russian Federation)*

## Russia and Canada in the Northern Dimension: Economic Development of Northern Regions

**Chairperson(s):** *Anastasia LOMAKINA, Tatiana KUZMINA*

- Impact Factor of Canada's Soft Power on the Development of the Northern Territories

  *Tatiana KUZMINA (Russian Federation)*

- Tracing Development Trajectories: Unraveling Northern Development Projects in Canada and Russia

  *Andrey PETROV (USA)*

- La pauvreté et les budgets des ménages des peuples autochtones de la Yakoutie et du Québec

  *Nikita BOCHKAREV (Russian Federation)*

- The role of single industry-cities in socio-economic development of Murmansk region, Russia

  *Yuliya ZAIKA, E.I. GOLUBEVA (Russian Federation)*

- Urban settlements in the Russian Arctic as the main object of the impact of natural risks: settlements' dynamic



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*Vyacheslav BABURIN, Stepan ZEMTSOV (Russian Federation)*

**POSTER EXHIBITION**

**Russia and Canada in the Northern Dimension: Economic Development of Northern Regions**

- Comprehensive analysis of the Northern Areas development in Russian Federation and Canada

  *Elena SAFONOVA (Russian Federation)*

- Functional zoning of territories traditional land use of indigenous peoples of the Russian North (on example Khanty-Mansi Autonomous Okrug)

  *Dmitry M. MARINSKIKH, A.V. KIRILLOV , A.N KUZMENKO, O.A. PRITUZHALOVA, N.A. SAMSONAS, M.N. ZHGUNOVA (Russian Federation)*

- Innovative financial mechanisms to address housing gaps in remote communities: the case of Nunavik, Quebec

  *Jason DION, Avet KHACHATRYAN (Canada)*



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## The Kets Ethnos And Its "Feeding Landscape": Ecological-Geographical And Socio-Ecological Problems Under Globalization And Changing Climate

Alexey MEDVEDKOV (Russian Federation)

The report discusses the modern state of the Kets ethnos, its cultural heritage, and existing problems. The report analyzes the role of social factors in the transformation of traditional economy and the Kets philosophy at the modern stage. Using analysis of the data collected, the climatic impact on the traditional resource use of the Kets people has been identified. The report suggests possible ways of diversification of traditional Kets economy under the existing organization of economy in the remote regions of the country. Global climate warming increases the dependency of traditional Kets economy on the environmental and geographical factors (natural-environmental resources of the taiga, natural disasters, natural risks of different origin, etc.).



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**Role of Institutions in Building Resilience in Single Industry Towns in the Russian North**

Julia LOGINOVA (Australia)

The study examines institutional response across scales to economic crisis in single industry towns in northern Russia. In response to challenges of collapse of the Soviet Union, the long-term community development goal for such resource-based places was to become more resilient, sustainable and diverse. The study first reviews historical development and economic challenges of coal industry in Vorkuta and Inta in northern Russia. Then, it examines the response to the economic crisis by various institutions ranging from local to national level. The paper concludes with a discussion on the impact of institutional interconnections on transformations of resource dependent communities. Do they contribute to local resilience or undermine local sustainability?



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## Measuring Prospects for Ethno-cultural and Demographic Sustainability of Indigenous Village Communities

Anatoly YAMSKOV (Russian Federation)

Rural indigenous communities, involved in traditional economic activities, have better opportunities to preserve ethnic identities and cultures. The Soviet/Russian system of village administrations with "household books" provides data, adequate for assessing proportions of those working in traditional sector of economy and for measuring prospects for demographic and ethno-cultural sustainability of local communities. After field work in the Amur basin and other areas, the author worked out quantitative social-demographic indicators for such measurements (Yamskov, 1999) and possible legal definition of "traditional economic activities" of indigenous peoples of the North in contemporary Russia (Yamskov, 2000). The revised set of indicators consists of: proportion of ethnically homogeneous "full" households (with both spouses up to 59 years old and with at least one child or teenager up to 17 years); proportion of retired persons' households (with one or more persons of 60 years and older); index of aging (the ratio of the latter to the former in the village). The author explains techniques of collecting and processing demographic and social data on the village level, and attempts to prove that such indicators can really provide insight into the immediate demographic and ethno-cultural future of the indigenous village communities and that his definition of "traditional occupations" can help the authorities to differentiate those members of the local communities who should enjoy preferential status in the use of biological resources. The report was prepared with financial assistance of the RFBR grant № 15-06-02279



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**Cultural landscapes of indigenous population of the Russian Arctic as national heritage**

Tatiana KRASOVSKAYA (Russian Federation)

Active actions of federal and regional authorities for protection of spatial cultural heritage objects (historical battle fields, country estates etc.) ignore cultural landscapes of indigenous population of the Arctic zone. Original semiotic arrangement of aborigine cultural landscapes revealing different from European world outlook must be regarded as cultural heritage threatened by modern pattern of economic development which does not accept integrity of aborigine cultural landscapes at the territories of traditional nature management and even do not notice their existence considering such lands virgin. Man-nature relations connections are revealed in aborigine cultural landscapes brightly and originally The structure and functions of such cultural landscape is supported by geographically determined cultures. The existence of unaltered aborigine cultural landscapes is hardly possible. But even consideration for their fragments may help to preserve indigenous peoples of the North cultural heritage. Methods of identification, mapping of northern aborigine cultural landscapes for the sake of their preservation need multi- discipline geographical approach.



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## Russian Sami in a changing world

Ekaterina MAKAROVA (Russian Federation)

Sami live in the territory of several countries (Norway, Finland, Sweden and the north-west Russia) which have different socio-economic and legal systems as well as legislation for indigenous peoples. Sami belong to the Indigenous Small-numbered Peoples of the North (ISPN) and are involved in both traditional crafts (reindeer herding, fishing, hunting, gathering) as well as modern activities. Currently the number of Sami living in the territory of the Russian Federation is less than 2,000. Until the early twentieth century use of nature in the Kola North developed in harmony with the environment. Indigenous peoples had a symbiotic relationship with nature dominated primarily by such fundamental and traditional activities as reindeer herding, fishing and hunting. In 1930-ties the industrial type of nature use started. Means and methods of industrialization of the Murmansk region ran entirely counter to the environmental capacity of northern ecosystems and to use of nature methods familiar to the indigenous peoples. This caused environmental stress and worsened their quality of life. The resulting structure of natural management, active industrial development of the Kola Peninsula and Soviet-era forced collectivization and re-socialization of Sami led to the almost complete destruction of their traditional culture, economy and the way of life. At the same time intensive influx of people from other regions of Russia and the change in lifestyle of Sami including transition from nomadic to settled lifestyle in turn contributed to a gradual increase in the percentage of mixed marriages to 80-90%. In the last 10-15 years there is a tendency of gradual improvement. Russia has created a variety of regulations and government programs to support the indigenous peoples of the north. Russian Sami increasingly identify with their ethnicity and culture. Almost extinct languages and cultures are being revived. Attempts of carrying out cultural transmission are conducted. To this end Russian Sami actively collaborate and share experiences with Sami from Scandinavian countries.



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**Impact Factor of Canada's Soft Power on the Development of the Northern Territories**

Tatiana KUZMINA (Russian Federation)

The author argues that effective Soft Power implementation by Canada is becoming an increasingly important factor attracting investment and ensuring the Northern Territories' development. Canada is one country that has made soft power a hallmark when utilizing its Northenity that results in an economic growth. For the second year in a row, Canada led the world in a major study of "national brand" strength, ranked on axes including "quality of life", "value system", and "good for business. All mentioned above benefit both the settlement infrastructure and transport network. Especially it is evident in such spheres of the local economy like tourism, communication, construction and local people entrepreneurship. The presentation concludes by suggesting that the experience of implementation of Canada's Soft Power can result in measured outcome for the economy and business.



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**Tracing Development Trajectories: Unraveling Northern Development Projects in Canada and Russia**

Andrey PETROV (USA)

Twentieth century development efforts have not succeeded in either Russian (Soviet) or Canadian North, despite belonging to different economic and political systems. It seems that now more than ever with the Arctic becoming a more desirable and contested space, both Canada and Russia are actively searching for better ways to manage their northern margins. However, the causes of the past failures (and resultant current problems), embedded in respective development regimes, have not been yet systematically evaluated. A conceptual gap in the knowledge about northern development is especially large, since northern peripheries have traditionally been on the margin of economic geography theorizing. This paper uses a combination of discursive analysis and regulation theory to examine the genealogy and outcomes of northern development trajectories. It argues that the Canadian and Russian northern development regimes shared profound commonalities. Both colonial endeavors, development regimes in the North are genealogically linked to the Western discourse of development that uses the 'othering' of non-Western regions to justify commodifying, exploiting and governing the 'other.' I identify these primary similarities, while noting some fundamental differences. I argue that regulation frameworks in Canada and Russia also shared important similarities as they both were based on the priority-constraint system of allocating investments, regulated by the ad hoc bargaining among multiple actors. From these positions, the paper compares and critiques past and present policies of regional development in the Canadian and Russian northern frontiers, and discusses their viability. I finish by pointing to possible alternative perspectives that reconcile an emerging postcolonial paradigm of development and realities of post-Fordism.



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**La pauvreté et les budgets des ménages des peuples autochtones de la Yakoutie et du Québec**

Nikita BOCHKAREV (Russian Federation)

La province de Québec et la République de Sakha (Yakoutie) partagent plusieures caractéristiques géographiques, économiques et sociales communes. Le Québec et la Yakoutie sont les plus vastes régions du Canada et de la Russie respectivement occupant 17-18% des territoires de leurs pays. La variété et la similitude des zones bio-climatiques, les richesses des ressources naturelles autant que certains caractéristiques sociales telles que faible densité de population, inégale occupation du territoire et les peuples autochtones relèvent la ressemblance de ces territoires. La colonisation des deux régions a commencé à la même époque aux 16-17 siècles avec l'arrivé de la civilisation européenne. Malgré les différences des politiques autochtones au Canada et en Russie, des niveaux de développement économique de deux pays, les problèmes des peuples autochtones aujourd'hui sont similaires: chômage, alcoolisme, faible niveau d'éducation. Le niveau de vie des autochtones est bien inférieur à celui des populations en moyenne. La recherche présente vise à relever le modèle économique d'un ménage typique yakut et a vérifier si ce modèle est valable pour les études des ménages indigènes au Québec. La révélation de la structure des revenus et des dépenses des représentants autochtones, est nécessaire pour relever les besoins et les priorités contemporains de la population locale.



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IGU 2015 – 2663

**The role of single industry-cities in socio-economic development of Murmansk region, Russia**

Yuliya ZAIKA, E.I. GOLUBEVA (Russian Federation)

Single-industry cities are the model cities of the times when Soviet Union planned the wider exploration of natural resources, industrialization and urbanization of its Arctic territory. Since 30's of the last century these cities along with other northern settlements played a significant role in exploration and development of the Arctic. Murmansk region is one of the regions within the Arctic zone of the Russian Federation; and is one of the most heavily industrialized territories. Among other Arctic territories of Russia, region holds the first place by the number of single-industry cities (8). At present 23% of the region's population live and work in single-industry cities (based mostly on mineral resource industry) and set up the greatest industrial potential for further socioeconomic and sustainable development of this area. We aim to evaluate the pathways of past and present development of these cities; describe socioeconomic and environmental indicators of well-being of their residents as well as sustainable development of the cities themselves; and suggest the possible future positive and negative scenarios for the development (based on evaluation of statistics, factor analyzes and community consultations). Northern single-industry cities have a number of specifics which make them different from the same cities of other territories, but these specifics are somehow international. About 1 million residents live in some 1000 resource towns across Canada. Evaluation of commonly shared challenges and Canada's experiences and legacies for sustainable development of these resource communities might help to foresee the future strategies for further economic development of Murmansk region.



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**Urban settlements in the Russian Arctic as the main object of the impact of natural risks: settlements' dynamic**

Vyacheslav BABURIN, Stepan ZEMTSOV (Russian Federation)

Socio-economic space of the Russian Arctic can be represented as a core concentration within urban settlements. These cities are the main target of the Arctic natural changes influence, including the strengthening of natural hazards. Residential areas of the Arctic cities do not exceed 200 thousand hectares. However, the region is characterized by the predominance of the mining industry, which allows us to estimate the area of activity in 200 thousand square kilometers. That is why, the methods of the demographic potential (based on gravity models) is the most appropriate. We studied the dynamics of urban settlements in the Russian Arctic from the 19th century. Several stages were allocated. Every stage of urbanization was accompanied by changes in industrial specialization. There was a shift of production activities to the east and the change in specialization from fishery and forest industry to mining and oil and gas production. During the whole period, Arkhangelsk remained the largest city with the most diversified economies. Nowadays, Arkhangelsk is the only one and the largest agglomeration in the world Arctic. In general, three the most developed regions (Murmansk, Arkhangelsk and Yamalo-Nenetsk regions) accounted for about 3/4 of the total urban population. The main demographic and economic potential is still concentrated in the area of the White Sea-Barents Sea coast (about 55%), although it is a historic percentage minimum. In the last 40 years, the proportion of Yamalo-Nenetsk region in the urban population increased from 2 to 20%. The results of the analysis can determine the key priorities in the study of global and local natural processes influence on population and economy of the Russian Arctic, as well as the choice of strategy for its development.



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**Comprehensive analysis of the Northern Areas development in Russian Federation and Canada**

Elena SAFONOVA (Russian Federation)

The main aim of this work is to analyze current strategies and approaches to property development of the Northern Areas, to compare the level of economic development, including the presence of large centers of primary and secondary production, established infrastructure, and number of resident population. Also will be elicited the involvement level of these regions in the countries' industry and calculated the share derived from this areas in countries' industrial production, investigated the question of their potential role in the countries' economy according to their resource availability.



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**Functional zoning of territories traditional land use of indigenous peoples of the Russian North (on example Khanty-Mansi Autonomous Okrug)**

Dmitry M. MARINSKIKH, A.V. KIRILLOV , A.N KUZMENKO, O.A. PRITUZHALOVA, N.A. SAMSONAS, M.N. ZHGUNOVA (Russian Federation)

Modern aspects of sustainable development of indigenous peoples related to spatial issues of traditional land use organization. Industrial development of lands, which is used by natives, often leads to negative factors having impact on the environment and traditional lifestyle. An example of this situation is the Khanty-Mansiysk Autonomous Okrug – Yugra (KHMAO), where the 1960s being the oil and gas development. At present, more than 70% of habitat of indigenous peoples falls within the reclaimed license area. In these areas are regularly caused conflicts between mining companies and indigenous peoples. Functional zoning – the division into areas with different priority functions and modes of protection and use, - can be a spatial planning instrument for territories traditional land use (in Russian law – TTP). The functional zoning of TTP intended to preserve natural resources and ecosystem services, which maintain traditional lifestyles of indigenous peoples, and, moreover, does not hinder the implementation of strategic plans for the regional development. Methodology of zoning involves the allocation within the boundaries of TTP functional areas with different regime of nature protection and land use by taking into account their natural, cultural and other features. At present, functional zoning scheme contains 12 taxonomic units, grouped into 3 functional zones (strict protection, protection, restricted land use). In Surgut and Nizhnevartovsk regions of the KHMAO in 2012-2013 was conducted functional zoning of 240 TTP, which allowed us to estimate the actual borders of land use, to identify conflict areas, set the size and location of the most productive farmland. Users of the functional zoning of TTP are public authorities KHMAO (Department of natural resources).



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IGU 2015 – 4007

## Innovative financial mechanisms to address housing gaps in remote communities: the case of Nunavik, Quebec

Jason DION, Avet KHACHATRYAN (Canada)

Communities in Nunavik, Quebec are experiencing housing supply gaps. Current estimates suggest a gap of 700 housing units at a total cost of CAD $315 million, not accounting for population growth. The gap has multiple and interlinked causes, including geographical remoteness, high construction and heating costs, and limited income streams for residents. Feasibility of rental schemes is limited due to constrained revenue generation in Nunavik, and rental defaults are frequent. Nunavik's situation poses challenges for Canada's Federal and Provincial authorities since there is no single solution that can address it. The history of rental defaults makes it difficult to attract private and institutional investors, and rental contract holders do not have sufficiently stable incomes to support the use of fixed income financial instruments to fund future housing needs. Increased public subsidies may help address the immediate housing needs, but may not be a feasible long-term solution. Our analysis aims to explore potential solutions to the Nunavik housing gap by focusing on the options for using performance-based incentives in the allocation of subsidies, as well as fixed-income financial instruments not linked to future revenue streams. Based on research on global practices in financing remote communities and analysis of Nunavik residents' income streams, we will propose practical and innovative financial instruments to help address the housing gap. These findings may be of interest to economists and planners both in Canada and in other countries that have Northern communities, including Russia.



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# Sediment redistribution and exogenic processes dynamics in small river basins

## Sediment redistribution and exogenic processes dynamics in small river basins 1

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- The rate and magnitude of sedimentation in the Goronyo Reservoir (1984-2013), Sokoto State, Nigeria

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- Conditions and patterns of extreme and specific channel processes emergence

  *Danila SHKOLNYI (Russian Federation)*

- Sedimentation and associated nutrients in the riparian zone of the Three Gorges Reservoir, China

  *Yuhai BAO (China)*

- Multifacet sedimnet transport study in a small volcanic cathment

  *Anatoly TSYPLENKOV (Russian Federation)*

## Sediment redistribution and exogenic processes dynamics in small river basins 2

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- Assessment of hydrological processes and sediment dynamics in the Mugello basin

  *Elmar SCHMALTZ, Michael MÄRKER, Yulia KUSNETZOVA, Petr KHOMYAKOV, Tobias RENTSCHLER, Hans ROSNER (Germany)*

- Monitoring the evolution of a well-developed gully to a small scale gully-system from 1889 to 2015 using geomorphometric, geophysical and remote sensing approaches, NE Romania

  *Elmar SCHMALTZ (Germany)*

- Model of suspended sediments transport for lowland rivers under the influence of hydrotechnical structures on an example Koronowski Reservoir

  *Dawid SZATTEN, Michael MAERKER (Poland)*

- Indicators of rivers geomorphological functionality, application of the EU Water Framework Directive in Sicily (Italy)

  *V. AGNESI, S.E. ANGILERI, M. CAMA, C. CONOSCENTI, E. ROTIGLIANO* (Italy)

- Characteristics of a fine sediment behavior in debris gorge in the Western Pacific Region

  *Goro MOURI, Sergey CHALOV (Japan)*



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**Sediment redistribution and exogenic processes dynamics in small river basins 3**

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- Morphometric characterization of a calanchi inventory in Sicily, Italy

  *CARABALLO-ARIAS, N A; CONOSCENTI, C; Di STEFANO, C; FERRO, V (Italy)*

- Sediment redistribution in submountain small river basin: case study from the Black Sea coast

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**Sediment redistribution and exogenic processes dynamics in small river basins 4**

**Chairperson(s):** *Yulia KUZNETSOVA, Christian CONOSCENTI*

- Factors and rates of lateral transport of solid phase products of soil formation and its impact on state of soil cover (magnetic tracer method)

  *A.N. GENNADIYEV, K.R. OLSON, A.P. ZHIDKIN, R.G. KOVACH, T.S. KOSHOVSKII (Russian Federation)*

- Detailed quantification of the small river basin recent sediment budget based on reconstruction of post-fallout redistribution of the Chernobyl-derived radioactive caesium-137 (Lokna River, Tula Region, European Russia)

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- Estimates of slope exogenic processes intensity utilizing terrestrial laser scanning

  *Oleg ERMOLAEV, Bulat USMANOV, Artur GAFUROV (Russian Federation)*

- Spatial modeling of suspended sediment in the European territory of Russia

  *Kirill MALTSEV (Russian Federation)*



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## POSTER EXHIBITION

### Sediment redistribution and exogenic processes dynamics in small river basins

- Change of erosion activity in the context of climate change

  *Svetlana BUDNIK (Ukraine).*

- Characterization of the soil properties in agricultural areas affected by shallow landslides: application in Messina area (Sicily)

  *Mariaelena CAMA, Chiara CAPPADONIA, Christian CONOSCENTI, Luigi LOMBARDO, Giuseppe MONTANA, Edoardo ROTIGLIANO (Italy)*

- CART-based gully types classification: a case study in Sicily (Italy)

  *S.E. ANGILERI, V. AGNESI, C. CONOSCENTI, E. ROTIGLIANO (Italy)*

- Incision rates and constrains of some riverbeds by artificial meander cut-off in Boso Hills, Central Japan

  *Takushi MAEDA (Japan)*

- The study of granulometric composition of contemporary suspended and bed sediments of rivers of Volga-Kama basin

  *Albert GILYAZOV (Russian Federation)*

- Erosion and accumulation in the basin of river Chern

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- Terrestrial laser scanning for recent denudation activity studies

  *Mikhail DRUGOV (Russian Federation)*

- Organic matter content in suspended sediment flux of the small catchments at the taiga-tundra transition and its projected change

  *Nikita TANANAEV, Lyudmila LEBEDEVA (Russian Federation)*



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**The rate and magnitude of sedimentation in the Goronyo Reservoir (1984-2013), Sokoto State, Nigeria**

Sheikh D. ABUBAKAR, M. ALIYU (Nigeria)

Goronyo Reservoir was impounded in 1984 on the Rima River and it has a storage capacity of 942.000.000 m3 and a catchment area of 21.445 km2. Construction of dams and reservoirs lead to modification of the hydro-morphological river regime which facilitate sediment deposition in the reservoirs. This is the main reason that makes reservoirs to serve as sediment traps. The aim of this study was to find out the rate of sedimentation and the volume of sediment deposited in Goronyo reservoir from 1984 to 2013. The research was carried out using bathymetric survey method. Geo-referenced depth data were collected with an echo sounder. The current water volume in the Reservoir was computed from the collected bathymetric data using Surfer 11 software. The study revealed that the volume of sediment accumulated in the Reservoir from 1984 to 2013 was 24,490,315 m3. It is concluded that low volume of sediment was deposited during the 29 year age of the Reservoir which signifies low rate during the period. Recommendations of the study include the need for repeated bathymetric surveys in the future and monitoring of both catchment erosion and sediment transport.



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**Conditions and patterns of extreme and specific channel processes emergence**

Danila SHKOLNYI (Russian Federation)

Extreme and specific channel processes was classified with parameterization by their features. Hardly predictable abrupt occurrence, very high rates and duration of riverbed deformations which are exceeding typical values considered as signs of the process extremeness. Increased rates of riverbanks erosion, aimed sediment accumulation and downcutting, accelerated avulsions of braided streams and anomaly fast meander cutoffs considered as extreme manifestations. Factors of occurrence of extreme channel processes were allocated into groups. Main factor is underlying surface (of channel and valley), which is influencing the temporal variability of the vertical deformations, riverbed surface curve evolution and channel network formation. Banks resistance, their morphometry and grain-size features are influencing the rates of planar deformations and local formation of specific channel types. Influence of water regime most clearly shown during abrupt changes of stream power and may vary from temporary increasing of erosion-accumulative processes to complete stream rebuilding. Specific forms of channel processes can relate to: tidal effects in river mouths, logjams and timber drifting in forest regions, ice floating and jams, volcanic activity etc. Influences of catastrophic natural processes in channel regime are individual and depending on their direct or indirect impact. Most of that processes are accompanied with instant inflows of solid material and changes of local base levels, which involves changing of channel processes vectors from natural conditions. The author highlights 20 types of specific channel processes based on own surveys and scientific papers. Each type was identified by signs, kinds and factors of extremeness and distinctions from the typical features.



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IGU 2015 – 1400

**Sedimentation and associated nutrients in the riparian zone of the Three Gorges Reservoir, China**

Yuhai BAO (China)

The riparian zone between the elevations of 145–175 m in Three-Gorge Reservoir has experienced a novel hydrological regime with half a year (May–September) exposed in summer and another half(October–April) submerged in winter. Sedimentation processes have been active along the shorelines in this zone since the reservoir operation in 2006. The magnitude and spatial pattern of sedimentation and nutrient loading were investigated in a typical section of the riparian zone, and explored their links to the changed hydrologic regime. The results showed that multi-year cumulative net sediment depth decreased rapidly with increasing elevation, which should be closely related to the specific pattern of water level regulation induced by regular dam operation and sediment dynamics of the Upper Yangtze River. The observed annual averaged sediment depth in the lower portions of the riparian zone (below 155m) was 14.9cm, and sediment depth rapidly decreased in the upper portions (above 155m) of riparian zone, with an annual average value of 2.6cm. Meanwhile, particle selectivity has taken place during sediment delivery along the reservoir that coarse fraction was prior to deposition, which consequently led to the longitudinal finer pattern of both suspended and riparian sediments. Sediment-associated 137Cs activity, organic matter and total nitrogen increased along the reservoir, indicating the external input of sediment yields from local catchments by surface erosion.



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**Multifacet sedimnet transport study in a small volcanic cathment**

Anatoly TSYPLENKOV (Russian Federation)

The research focuses on the sediment transport of rivers draining slopes of Avachinsky volcano which is located on Kamchatka peninsula. As far as no long-term hydrological data is available for the rivers draining volcanoes, the main purpose is a field-based assessment of water and sediment discharges within case study river length is about 25 kilometers. Sediment transport is determined by diurnal, within-year and long-term regime of water flow fluctuations originated from seasonal/daily weather changes under strong impact of local petrology anomalies and intensive groundwater seepage. The study focuses on integrative approach to study sediment transport in catchment-river scale. Field approach is based on water discharges, levels, suspended sediment concentration, turbidity, sediment load measurements at the gauging station 4-12 times daily depending on hydrological condition in 2007, 2010, 2012-2014. Sediment budget model concern the soil erosion and volcanic landslides into account and compute the surface runoffs and sediment runoff to simulate the long-time scale movement. SedNet, WEPP and USPED were run to calculate the sediment budget in the basin. The integrated results based on empirical field data and model outputs revealed that suspended sediment discharge variates from 675 to 448 t/year along the length of the river. USPED modelling results show that main erosion fields connected to volcano's slopes characterized by very steep slopes (more then 40 degrees).



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**Assessment of hydrological processes and sediment dynamics in the Mugello basin**

Elmar SCHMALTZ, Michael MÄRKER, Yulia KUSNETZOVA, Petr KHOMYAKOV, Tobias RENTSCHLER, Hans ROSNER (Germany)

The Mugello valley ca. 40 km North of Florence is known for early human artifacts found in different topographic situations. However, up till now the find locations have only been described qualitatively in terms of location and topography but not in terms of landscape evolution including the geomorphic and hydrologic context which is based on the erosion, transport and deposition processes. Therefore the main objective of this study is to assess the environmental relations and processes around the find locations. Thus, we investigated both: i ) the landforms and ii) the respective landscape forming processes. Therefore we applied a detailed terrain analysis based on a 10m DEM. Moreover, we assessed vegetation and landuse changes in the last decades by means of remotely sensed Landsat data. This information was subsequently utilized to set up a surface runoff model based on soil hydrological characteristics measured in the field. For this model the precipitation input was also explored in terms of return periods and extreme events. Finally, we assessed erosion and deposition processes as well as mass movements, the two major landscape forming processes in the area with a semi-quantitative modeling approach. In order to get information on the landscape evolution in the Mugello valley, besides the preset day climate data, we deciphered also Paleo-climatic conditions. Hence, scenarios are formulated that can be evaluated applying the above mentioned process models.



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## Monitoring the evolution of a well-developed gully to a small scale gully-system from 1889 to 2015 using geomorphometric, geophysical and remote sensing approaches, NE Romania

Elmar SCHMALTZ (Germany)

The intensity of geomorphological processes has reached record levels across the world. Gully erosion is a huge problem for agricultural lands in the Moldavian Plain, within Bahlui river catchment near the provincial capital of Iasi, Northeast Romania. The focus of the study is the hydrological catchment of the well-developed gully 'Gurguiata Mare'. Differential GPS measurements, historical topographic maps and multi-temporal airborne and satellite based images highlight the geomorphometrical development of the gully. Detailed historical topographic maps of the area show an increasing growth potential of the gully due to land use changes like farming in the western area of the gully. The comparison between these topographic maps, remote sensing data and geomorphometrical surveys shows a distinctively fast growth of a branch in the eastern part of the gully, named 'Gurguiata Mica'. However, rill- and interrill erosion processes in the western part of the gully may reactivate erosion processes of old gully branches. Particular emphasis was set on the deposition area and the heads of the gully system. Consistent gullying in the eastern part of the catchment – with several ten centimeters in length per year, observed for the 'Gurguiata Mica' – show the high gully erosion potential in the catchment. Additionally, the particularly high erosion dynamic branch 'Gurguiata Mica' was surveyed in detail with ground penetrating radar (GPR). The temporal and spatial differences in gully growth lead to the assumption that the 'Gurguiata Mare' reached its erosion potential uphill the catchment and is going to develop to a small catchment gully-system.



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**Model of suspended sediments transport for lowland rivers under the influence of hydrotechnical structures on an example Koronowski Reservoir**

Dawid SZATTEN, Michael MAERKER (Poland)

Artificial water reservoirs fulfill many functions. The most important are: flood control, retention, energetics and recreation. All of them play a significant role in water management. Division of the Brda River in the 60's of the twentieth century and construction of a dam had influence on the circulation of matter in the whole water ecosystem. Koronowski Reservoir was created by soil dam on the 49.115 km of the Brda River. The surface, while normal backing up level - 81,5 m above sea level, amounts to 16.0 km2 and a volume of 81.0 million m3 which classifies Koronowski Reservoir in fifteenth place in the country. Total 25 m difference in levels allows to produce annual average of 40.841 GWh of electricity which classifies power plant Koronowo in the top ten producents of energy from natural sources in Poland. The research showed that the artificial reservoirs reduce the amount of suspended load in the stream channel below the reservoir. Research included: making the actual detailed bathymetric plan, in order to calculate the volume of water stored in the reservoir, carrying on hydrometric observation (measurement of water flow) on the inflows and outflows from the reservoir in order to specify the hydrological balance, measuring the concentration of indicators in order to identify the suspended load in the water, specifying the balance of suspended material in Koronowski Reservoir in full hydrological year.



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# Indicators of rivers geomorphological functionality, application of the EU Water Framework Directive in Sicily (Italy)

V. AGNESI, S.E. ANGILERI, M. CAMA, C. CONOSCENTI, E. ROTIGLIANO (Italy)

Many river systems in Europe suffer from human pressure. For this reason the European Water Framework Directive (WFD; 2000/60/EC) was created for river basin and floods management. In 2010 the Italian Environmental Minister issued the WFD and a protocol for the stream hydromorphological evaluation, analysis, and monitoring was established (IDRAIM). The Morphology Quality Index (MQI) is part of this procedure and defines the deviation of present geomorphic reach situation from reference conditions. It is composed by Indicators of Geomorphological Functionality (IGF), Indicators of Artificiality (IA) and Indicators of Channel Adjustments (ICA). The present work aims at illustrating the calculation of IGF in 34 river catchments located in the Eastern part of Sicily (Italy). The procedure was characterized by three main steps: i) subdivision of the river network into relatively homogeneous reaches depending on landscape units, valley setting, channel slope; ii) evaluation of confinement classes (the percentage of banks not directly in contact with the alluvial plain but with hillslopes or ancient terraces) and confinement index (the ratio between the alluvial plain width and the channel width); iv) identification of river morphological typologies (sinuosity, braiding and anastomosing indices). In order to calculate the IGF, GIS analysis, photo interpretation, historical data collection and geomorphological fieldwork were integrated. Results showed that the IDRAIM procedure for the calculation of the IGF can be successfully applied for the Sicilian Rivers. However, being the Sicilian rivers mainly characterized by a torrential regime, some adjustments of the IGF procedure could be suggested.



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**Characteristics of a fine sediment behavior in debris gorge in the Western Pacific Region**

Goro MOURI, Sergey CHALOV (Japan)

Debris gorges are common in the volcanically active mountainous environment of the Western Pacific Region, but they are almost absent in subdued landscapes such as the Tibetan Plateau, where shrinkage rates are higher. Our study shows that the effects of debris on the shrinkage of the gorges of the Western Pacific Region cause differences in the way the gorges respond to climate change, which is an effect that has been neglected in predictions of future water availability. Gorges and glacial meltwater make an important contribution to water quality of the drinking water, irrigation water, and hydropower supply in the Western Pacific Region. Global warming is expected to increase mountainous river discharge and snowmelt in the short-term, but predictions are uncertain in the long-term. Therefore, detailed and reliable baseline data in the volcanically active mountainous environment of the Western Pacific, and their impact on the cryosphere, are essential for predicting future water resources. The significance of debris gorges and its impact on regional differences in the volcanically active mountainous environment of the Western Pacific Region has not been established in the mountainous valley-belt of the region. In this study, we report the characteristics of a debris gorge during the beginning of the snowmelt period in the volcanically active mountainous environment of the Western Pacific.



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# Morphometric characterization of a calanchi inventory in Sicily, Italy

CARABALLO-ARIAS, N A; CONOSCENTI, C; Di STEFANO, C; FERRO, V (Italy)

Calanchi are a frequent type of badland landscape of Sicily (Italy), usually located in the middle of crops or forests. They are characterized by heavily dissected terrains with unvegetated slopes, knife ridge edges, V-shaped valleys and channels with a dendritic pattern, which incise and extend headwards. Calanchi exhibit, in smaller temporal and spatial scales, many of the geomorphic processes and landforms that may by observed in a fluvial landscape, hence, this type of badland may be considered as micro-watersheds where geomorphic dynamics can be related to their geometric features. The aim of this investigation was to evaluate the morphometric characteristics of calanchi landforms in Sicily (Italy). For this aim, DEMs obtained by LiDAR technology, with a horizontal and vertical resolutions of 2 m and 0.1-0.2 m, respectively, were used. In addition, orthophotographs with a pixel resolution of 0.25 m were exploited as a visual reference of the areas, as well as the images available on Google Earth. The morphometric characteristics were used to test two functional relationships: 1) an empirical relationship linking the volume of sediments eroded on a calanchi hydrographic unit to the total length of its main channel, and 2) a power relationship, established between two dimensionless groups of morphometric variables, that attests for a unique geometrical similarity condition between calanchi and smaller linear erosion landforms. Finally, the Hack's law was tested demonstrating that the shape of calanchi units becomes wider with the increasing their drainage area. This result was also proved by the analysis of the maximum length and width of each landform, which showed that width increments slightly faster than length when increasing their size.



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**Sediment redistribution in submountain small river basin: case study from the Black Sea coast**

Yulia KUZNETSOVA, Daria TSVETKOVA, Valentin GOLOSOV, Askar ILYASOV, Anatoly TSYPLENKOV (Russian Federation)

The dynamics of the whole river basin including sediment sources, variety and connections between sediment redistribution ways and mechanisms are an object of this study. Sediments involved into the dynamic system reallocated within the river basin by different exogenic processes, partly get into the fluvial network and then can be transported out of the original basin. A number and types of exogenic processes may vary depending on regional and local factors, including natural and anthropogenic conditions as well as basin morphology itself. Our case study basin is located in the Caucasus submountain area within Russian subtropical zone of the Black Sea coast. High temperatures and precipitation rates together with steep slopes and weak bedrocks prepare the natural conditions for a special exogenic processes activity and variety. Using a number of independent methods we monitor the rates of weathering (producing sediments in local conditions) and a set of presented exogenic processes working as different mechanisms of sediment redistribution (soil creep, landslides, gully erosion, piping and suffusion). Especial attention is paid to the channel processes including bank erosion and extreme events such as floods and flash-floods. The first results of quantitative monitoring of different processes and a conceptual model of the river basin functioning will be presented.



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**Assessment of hydro-erosive processes in small steep coastal basins in Liguria and Sicily, Italy**

Michael MÄRKER, Ivano RELLINI, Claudia SCOPESI, Elmar SCHMALTZ, Sergey CHALOV, Silvia ANGILERI, Mariaelena CAMA, Christian CONOSCENTI, Luigi LOMBARDO, Edoardo ROTIGLIANO, Marco FIRPO (Germany)

The steep Mediterranean catchments underwent drastic socio economic changes in the last decades. Moreover, these basins are also subject to climate variability and potential future climate change effects. Due to mechanization in agriculture a lot of surfaces changed from terraced vineyards and olive growth to abandoned land. The terraced areas are less productive and more cost and labour intensive and hence cannot compete with a highly mechanized agriculture. Furthermore, tourism based on the natural and cultural heritage of the region is more and more important for the income of the inhabitants. The abandonment has effects on the entire landscape system in terms of hydrological dynamics, sediment dynamics as well as soil characteristics and the terraces itself. These changes are leading to a succession in vegetation, destabilization of slope systems, and changes on the runoff and sediment discharges leading to disasters such as the Vernazza event on the 25.10.2011 or the Messina event on the 01.10.2009. In this study, we present a comparison between the two mentioned areas located respectively in Liguria in the Cinque Terre National park (World heritage site-UNESCO) and in the Messinean area, Sicily (Italy) and a test of transferability aimed to assess debris flow susceptibility. In the framework of this research extensive fieldwork, remote sensing and terrain analysis have been performed in order to parameterize both stochastic and physically based models. Moreover, few attempts of reproducing extreme events have been made. The results show that these Mediterranean catchments are highly sensitive to changes in landuse and climate. Hence, the study contributes to the understanding of landscape dynamics under global change conditions.



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# Predicting storm triggered debris flow events: application to the 2009 Ionian-Peloritan disaster (Sicily, Italy)

Mariaelena CAMA, Luigi LOMBARDO, Christian CONOSCENTI, Dario COSTANZO, Edoardo ROTIGLIANO (Italy)

Debris flows are shallow landslides triggered by extreme meteorological events and propagating into the drainage lines of a slope as a fluid. A debris flow susceptibility map depicts the spatial probability for future phenomena to be triggered in a given area. Stochastic approaches are widely used in landslide studies for the assessment of the susceptibility. In fact, they allow to obtain a predictive function which relates a response variable (presence/absence of landslides) and a set of physical-environmental variables which are expected to control the slope failure phenomena. Future landslide occurrences are typically predicted by studying a past landslide inventory, under the basic assumption that "new landslides will occur under the same conditions which drove the past ones". The present research is aimed at testing the basic assumption, in case of extreme event triggered landslide scenarios. The study case is the debris flow event occurred in the Messina area in 2009. In particular, by applying logistic regression, a model was calibrated by exploiting an inventory dated at 2007 and validated with respect the 2009 inventory (forward chrono-validation). Moreover, a model was calibrated with the 2009 and validated in predicting the 2007 landslides (backward chrono-validation). Under the basic assumption, the two modelling procedures should achieve the same results. Cross-validation procedures have been applied to investigate precision, reliability and robustness of the models, both in terms of predictive performance and inner structure of the model. The results of the research attest for high performance and good agreement between the two chrono-validated models. However, some differences arose, indicating possible limits in the basic assumption.



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# Modeling landslide susceptibility by using GIS-analysis and multivariate adaptive regression splines

Christian CONOSCENTI ; Valerio AGNESI; Silvia ANGILERI; Mariaelena CAMA; Nathalie Almaru CARABALLO-ARIAS; Marilena CIACCIO; Luigi LOMBARDO; Edoardo ROTIGLIANO (Italy)

Landslide susceptibility may be evaluated by defining statistical relationships between the spatial distribution of past slope failures and the variability of landslide triggering factors. In this research, susceptibility to landsliding was assessed by employing multivariate adaptive regression splines (MARS), a statistical model that has been rarely used to this aim. The experiment was carried out in an area of central Sicily (Italy), which is severely affected by shallow landslides mainly occurring during the wet autumn-winter semester. Bedrock lithology and a set of primary and secondary topographic attributes were exploited as proxies of main landslide driving factors. The robustness of the procedure and the predictive skill of the susceptibility models were evaluated by calibrating and validating the models on different samples of raster cells. Stable cells (absence of landslides) of these samples were selected using two different methods: i) a random selection of individual stable cells; ii) a selection of cells intersecting circles randomly distributed within the stable sectors of the study area. The fit of the models to calibration and validation samples was quantitatively assessed by drawing receiver operating characteristic (ROC) curves and by calculating the area under the ROC curve (AUC). The validation results indicate high accuracy and stability of the models, demonstrating the ability of MARS to effectively predict the spatial distribution of landslides. Moreover, a better performance was observed for models trained and tested using circular groups of stable cells.



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**Factors and rates of lateral transport of solid phase products of soil formation and its impact on state of soil cover (magnetic tracer method)**

A.N. GENNADIYEV, K.R. OLSON, A.P. ZHIDKIN, R.G. KOVACH, T.S. KOSHOVSKII (Russian Federation)

For the purpose of quantitative assessment of lateral transport of soil solid phase matter there was improved original methods of field soil sampling, microscope diagnostic and quantification of spherical magnetic particles in soil samples. Based on magnetic tracer method the impact of lateral transport of soil solid phase matter on state of soil cover has been studied. For the key sites in different landscape conditions of Russia and USA (Tula, Belgorod, Kursk, Moscow regions and states of Illinois, South Dakota, Iowa) the changes of chemical, physical and morphological soil properties, and features of transformation of soil combinations in structure of soil cover, resulting from lateral transport of soil matter, have been assessed. Features of soil matter transport within soil catenas on arable, steppe and forest slopes have been revealed. Systematization of catenas has been developed. For the first time the simultaneous application of magnetic tracer and radio-cesium methods for soil matter transport quantitative assessments has been carried out. The accumulation and dispersion zones of the solid phase material in the soil cover have been separated and conclusions about the genesis of these zones and their place in the migration structure of the catchment basin have been drawn. Impact of soil erosion on dehumification and emission of CO2 in the atmosphere has been studied. Data on regional trends of soil matter transport rates changes in relation to global warming for the last decades has been obtained.



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# Detailed quantification of the small river basin recent sediment budget based on reconstruction of post-fallout redistribution of the Chernobyl-derived radioactive caesium-137 (Lokna River, Tula Region, European Russia)

Vladimir BELYAEV, Maxim IVANOV, Valentin GOLOSOV, Evgeniya SHAMSHURINA, Nadezhda IVANOVA, Dmitry BEZUKHOV, Yuichi ONDA, Yoshifumi WAKIYAMA, Olivier EVRARD (Russian Federation)

Results of detailed quantification of sediment budget for the small river basin dominated by agricultural land use based on combination of 137Cs tracer approach with several independent techniques are presented. The study site is the Lokna River catchment (main river length about 20 km, area about 177 km2) located in central part of the Tula Region within the core of the so-called Plavsk radiocaesium hotspot – one of the most contaminated area of the European Russia as a result of radioactive fallout in spring 1986 following the Chernobyl nuclear power plant disaster. Levels of Chernobyl-derived 137Cs contamination exceed total values of the bomb-derived global fallout of 1950s-1970s for the area by several orders of magnitude. It was therefore considered as valid assumptions that the global fallout can be neglected and the Chernobyl fallout in spring 1986 regarded as a single event. These assumptions allowed simplifying the quantification of the 1986 to present sediment budget. In such landscapes the post-fallout redistribution of 137Cs is primarily associated with fluvial activity of various scales in cascade systems starting from soil erosion on cultivated hillslopes through gully and small dry valley network into different order perennial streams and rivers. Detailed information on 137Cs initial fallout and post-fallout redistribution has been obtained for several representative geomorphic units distinguished within the studied catchment area. It has been shown that most of the contaminated sediment over the time passed since the fallout has remained stored within the small dry valleys of the 1-4 Hortonian order and local reservoirs (>70%), while only about 5% reached the 5th order valley (the Lokna River itself).



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**Estimates of slope exogenic processes intensity utilizing terrestrial laser scanning**

Oleg ERMOLAEV, Bulat USMANOV, Artur GAFUROV (Russian Federation)

Despite the large variety of methods for estimating slope erosion intensity, it is still difficult to obtain accurate slope processes rates. Our report focuses on the development and application of terrestrial laser scanning technique to provide accurate estimates of slope processes intensities, and evaluate denudation quantities due to abrasion, landslides and talus processes. For erosion study, we chose a bare slope at the left bank of Kazanka River (Kazan city). Slope characteristics: average inclination 31.5°, southwestern exposure, average slope length – 18 m, relative excess – 9 m, slope has a linear shape in cross-section. Plot size is 0.07 hectares Study of landslide processes conducted at right bank of Volga River 60 km south from the city of Kazan, where under the action of the Kuibyshev reservoir, landslide processes actively destroys slopes. High-precision terrestrial laser scanning system Trimble® GX used for data collection. Differential maps between all stages of surveying and TIN-models were built in Trimble® RealWorks software. Inspection and cross-section tools were used for ground movements on the slope surface and the development of linear erosion forms detailed study. A new method for accurate estimates of the erosion has been developed. It makes possible to assess denudation-accumulative balance on erosive slopes, determine the dynamics of the volume of material moved in different slope parts in various events of surface runoff, and identify spatial regularities forming rill washouts. During the period of 2013-2014, erosion intensity varied from 0.1 to 13.5 mm, accumulation - from 0.1 to 7.6 mm for a single runoff event. As a result of subannual scanning of different types of landslides a detailed picture of process development obtained.



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**Spatial modeling of suspended sediment in the European territory of Russia**

Kirill MALTSEV (Russian Federation)

The mapping of river sediment yields at continental scale involves a number of technical difficulties that have largely been ignored. The maps need to show the large zonal peculiarities of river sediment yields, as well as the level (smoothed) local anomalies. This study was carried out to create a map of river sediment yields for the European territory of Russia at a scale of 1:1000 000. Two approaches were used for this mapping. The first approach was implemented for mapping the Volga river basin. The catchments of the gauging station were used as the mapping units. Physiographic (landscape) areas were used as the territorial units for mapping of the all territories. Physiographic (landscape) areas were presented on a thematic map in the physical and geographical atlas of the world issued in 1964 and edited in 2007. The data for preparing the map were taken from the long-term observations recorded at more than 1000 hydrological stations. The data have mostly been collected at the time span 1955–1975 years by applying a single method. The creation of this map from the study of river sediment yield is a major step towards enhancing international research on understanding the mechanical denudation of land due mainly to erosion.



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IGU 2015 – 2550

**Change of erosion activity in the context of climate change**

Svetlana BUDNIK (Ukraine)

Reorganization of spatially-territorial complexes of agricultural purpose Spent periodically in connection with repartition of the ground, change of character of landed property, etc. causes activization of erosive processes on slopes. Observed now change of climatic characteristics of the territory, caused by change of transits of cyclones, also promotes strengthening of activization of erosion processes. Supervision for slope a flow formed from downpours was spent by us in natural conditions of its formation. Researches have shown, that strong influence on a flow of deposits at downpours renders agricultural background, even the importance of influence of factors from agricultural background to agricultural background is various. Security of the greatest drain of deposits it was marked not at the greatest intensity deposits, significant influence here on a drain of deposits renders position of a maximum of intensity of deposits. The greatest drain of deposits is marked in a range of position of a maximum of intensity of deposits from 0,1 up to 0,3 units concerning the general duration of a rain. In our researches position of a maximum of intensity during loss of a rain is necessary on first half of rain (70 % of cases) is more often. Research shows that at downpours of significant intensity with a maximum of intensity in the beginning of a downpour humidifying of ground below, density of ground above, smashing of particles above, than at less intensive downpours and downpours with a maximum in second half of period of loss of deposits, as defines intensive washout of ground in first half of downpour. From positions strategists of steady development of territories expediently simultaneously with change of structure of land tenure to spend careful selection antierosion actions in view of the characteristics which have changed suitably- climatic of territory.



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# Characterization of the soil properties in agricultural areas affected by shallow landslides: application in Messina area (Sicily)

Mariaelena CAMA, Chiara CAPPADONIA, Christian CONOSCENTI, Luigi LOMBARDO, Giuseppe MONTANA, Edoardo ROTIGLIANO (Italy)

The determination of soil properties is considerable challenge when it is aimed to evaluate the spatial distribution of one or more parameters across significant surfaces. In fact, terrain sampling and field data are punctual measurement; therefore, quantitative models are needed to predict the spatial distribution of soil attributes. The spatialization of field and laboratory data is a very important information in landslide studies. Raster layers displaying soil properties can be used both for statistical models and for the parameterization of physically based models. The purpose of this work is to produce a detailed hydrological and mechanical characterization of the soil affected by shallow landsliding processes. The study area is located in Messina (Southern Italy) where a debris flow event occurred on the 1st October 2009. In particular, two small and independent (2 km2) hydrological units were chosen: Racinazzi and Saponarà catchments. The sample sites were selected using a provisional predictive pedologic model based on the topographic attributes Topographic Wetness Index and Steepness of slope. The field analyses were aimed to determine soil thickness, hydraulic conductivity and other soil mechanical properties. The fieldwork was carried out using: (1) Dynamic Cone Penetrometer (2) Amoozemeter (3) Auger sampler. The laboratory analysis of the collected samples have performed in order to characterize granulometry and the Atterberg limits. Stochastic approaches have been then adopted to regionalize the punctual information for each of the collected properties resulting in robust spatial distributions used to characterize landslide prone conditions. The results show the slope instability mainly affect the terraced areas characterized by the presence of a thin layer of soil which, according to the laboratory analysis, testifies an incomplete pedogenesis.



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**CART-based gully types classification: a case study in Sicily (Italy)**

S.E. ANGILERI, V. AGNESI, C. CONOSCENTI, E. ROTIGLIANO (Italy)

Gulling is a complex process depending on several factors and involving a wide range of sub-processes. Different types of gullies were distinguished and described in literature. Their contribution to soil erosion changes in relation with the typology and their presence is influenced by different controlling factors. Mapping and classifying gullies is crucial for monitoring soil erosion. So far, no systematic definition of morphological characteristics of the different types of gullies and of their controlling factors has been made. The present work aims to suggest an innovative approach to automatically classify gullies by integrating remote sensing, GIS and a classification algorithm. The study was carried out in three sub-catchments (20km2) of the Platani River basin, located in southwest Sicily (Italy). Two gullies inventories (2014 and 2008 years), containing more than 400 erosion features, were prepared by integrating Google Earth and aerial orthophotographs images and further field checks. Once mapped, gullies were classified by using the location in the landscape, the morphology and the dominant erosion process leading to their formation as criteria. Several primary and secondary topographic attributes were selected as independent variables in the classification model. The Classification and Regression Tree (CART) algorithm was used to predict the location of the different types of gullies and describe the influence of the different factors taking part of the model. The results, described in terms of AUC values, show high model accuracy. CART-based gully classification is quicker and more objective than traditional methods. Moreover, the suggested method provided important information about which is the dominant erosion process leading to gullies formation.



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**Incision rates and constrains of some riverbeds by artificial meander cut-off in Boso Hills, Central Japan**

Takushi MAEDA (Japan)

The Boso Hills are mainly composed of sedimentary rocks from the Neogene period, with a number of artificial channels distributed throughout the area. These channels, called "Kawa-mawashi", have been constructed since the Edo period or early modern times in order to short-circuit the channel, especially the incised meander. This artificial meander cut-off creates the difference of height between the present riverbed and the abandoned riverbed. In this study, we determined the incision rates of bedrock channel by measuring a height difference of the present and the abandoned riverbeds in addition to the age in which the meanders were cut, from the existing studies on "Kawa-mawashi". The incision rates of six channels indicated 3.95~15.89 mm/y. The principal factor in determining the incision rate is the ratio of the stream force to the bedrock resistance. A relationship between the incision rates and constrains is expressed by an empirical equation: H/T κ{γ A P tanθ/ (W Ss )}, where, H is the relative height between the present and the abandoned riverbeds, T is the duration of incision, γ is the mean specific weight of water, A is the drainage area, P is the mean annual precipitation in the catchment area, tanθ is the longitudinal slope of short-circuit section, W is the channel width, Ss is the shear strength of the bedrock, and κ is a dimensionless coefficient. The equation indicates that the rate is led by the force/resistance ratio except in the place with very high sedimentation in the riverbed.



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IGU 2015 – 1979

## The study of granulometric composition of contemporary suspended and bed sediments of rivers of Volga-Kama basin

Albert GILYAZOV (Russian Federation)

Granulometric composition of contemporary river sediments – both suspended and river bed – reflects the cumulative complex effect of natural and anthropogenic conditions on the river basin. Spatio-temporal variability of these conditions is responsible for a very mottled mosaic pattern of the particle size distribution of transported sediments. The data of granulometric composition of sediments and natural-anthropogenic conditions of 112 rivers and river basins of the Volga-Kama region in different phases of the water regime were studied. In the calculations were used only data on middle rivers with basin area from 2 000 to 50 000 km2, that reflect the zonal peculiarities of sediment runoff. The most important index of the particle size distribution of river sediments is their median diameter (d). Considered factors that controls particle size distribution of suspended and bed sediments are rock composition, relief, belonging to landscape area, degree of agricultural activities, presence of large ponds and reservoirs. Zoning of the Volga-Kama basin by median diameter of river sediments was fulfilled. Zoning is based on algorithms of cluster analysis. The largest suspended and bed sediments formed by the rivers that drain the Ural Mountains (d = 0.023 – 24.75 mm). Plain river of taiga are characterized by smaller diameter of river sediments (d = 0.021 – 0.51 mm). The smallest sediments are formed into forest-steppe (d = 0.013 – 0.44 mm) and especially steppe (d = 0.009 – 0.19 mm) regions of the considered territory which have a high degree of agricultural activities. Best of all these regularities appear in wet part of the year. Along with general regularity are observed local anomalies associated with lithological and anthropogenic factors.



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## Erosion and accumulation in the basin of river Chern

Artem FEOKTISTOV (Russian Federation)

Start of extensive land use leads to activation of erosion in agricultural areas. But the dynamics of gullies and small valleys lengths during the period of cultivation is not so well defined. Our investigation of fluvial network dynamics was conducted for a study basin River Chern. It is located in the northern part of the Kursk Region at its boundary with the Orel Region, within the forest-steppe natural landscape zone and currently heavily modified by people. A set of historic topographic maps (from 1860s to 1980s), data analysis of the distribution of the radioisotope 137-Cs, mathematical simulation and field studies were used. We found that the average rate of soil erosion from arable slopes was 8.4 t/ha/year, and the total amount of accumulation in the receiving basin pond was 55500 tonnes for the period after 1986, and 131780 tonnes for the period from 1975 to 1986. The structure of the redistribution of sediment for the investigated part of the basin river Chern for the period of active agricultural development (1975-1986) complies with the average values typical for the rivers of the East European Plain. After 1986 the situation changed: the total amount of eroded soil from arable areas has decreased, but there is accelerating the pace of accumulation in the bottoms of erosion forms and valleys of small tributaries with a decrease in the rate of sedimentation in the floodplain of the main river and in the receiving basin. The total length of the erosion network did not change essentially.



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**The dynamics of basin component of suspended load as an indicator for presence of gully systems in urban areas**

Tatiana GAIFUTDINOVA (Russian Federation)

Studying the dynamics of gully erosion in the territory of Naberezhnye Chelny (from 1954 to 1997) helped to determine morphometric changes of gully systems after an active construction of the city. The density of gully systems network on the territory of modern Naberezhnye Chelny is 0.02 km / km2. This index decreased 6.5 times as compared to the value before the active construction of the city. The density and gully indexes decreased 10 times and 6 times respectively. The density of gully systems is reduced due to their active transformation (total or partial filling). All gully systems under this study belong to the basin of the small river called Shilna, which flows into the Nizhnekamsk reservoir. In order to make a quantitative assessment of anthropogenic impact on the overall dynamics of suspended load in Nizhnekamsk reservoir during the study period (1954-1997), we need a method that determines the share of each gully system. In geo-ecological studies the dynamics of the basin component of suspended load of small rivers can become the main quantitative characteristic of the interference between gully systems and the town, located within their catchment areas, as well as an indicator of anthropogenic influence on large water objects (rivers, reservoirs, lakes).



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IGU 2015 – 1566

**Terrestrial laser scanning for recent denudation activity studies**

Mikhail DRUGOV (Russian Federation)

Terrestrial laser scanning (TLS) is widely used for different academic and applied researches, including 3D relief modelling. This work is focusing on applying TLS for denudation processes researches, including monitoring investigations. Research targets are active fluvial and coastal erosion landforms. Two TLS surveys have been conducted: at actively eroded coastal cliffs of the Baltic Sea near the Svetlogorsk Town, Kaliningrad region, and at actively eroded banks of the Tsanyk River within the Sochi City territory, Krasnodar region. Automated algorithms and additional field observations are used for post-processing of the TLS data. As a result, detailed digital 3D relief models which describe the recent state of the active landforms investigated have been obtained. Repeated measurements at the same locations will make it possible to calculate volumetric changes of those landforms and, subsequently, rates of the denudation processes involved. Results and approved methods can be used for denudation activity monitoring at these and other areas.



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## Organic matter content in suspended sediment flux of the small catchments at the taiga-tundra transition and its projected change

Nikita TANANAEV, Lyudmila LEBEDEVA (Russian Federation)

Global change is expected to alter the stocks and the pathways of the organic carbon and the areas adjacent to the southern border of permafrost are to be among the most affected. Suspended sediment flux is one of the important parts of the global carbon cycle, but the organic content in suspended matter of the permafrost region rivers is still poorly quantified. Our study found that in the small streams at the taiga-tundra transition region (Northern Yenissei region near the town of Igarka), organic matter content in suspended sediment varies from 16.4% to 74.1% during the summer-autumn low flow, depending on the geomorphological position of streams and the total suspended sediment (TSS) value. Absolute organic matter concentrations in suspension vary from 1.63 to 2.42 mg l-1 between the catchments. Contemporary suspended sediment flux was estimated for the Graviyka River, the major Yenissei tributary of the region, and is about 1850±30 t (5.64 t a-1 km-2). Annual organic matter transport is estimated using our regional findings to be 406 t (1936-2014 average). 'Hydrograph' model was used to assess the consequences of the air temperature (AT) increase on local hydrology. Air temperature increase is projected to increase thaw depth and thus to decrease both the spring freshet volume the organic matter flux in suspension. Suspended sediment flux is expected to decrease by 34% with AT increase by 2°C and by 44% with AT increase by 4°C. Suspended organic matter flux will decrease by 21% and 28% respectively. Research was funded by Russian Foundation for Basic Research, Project #14-35-50138.



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# Urban Climate and Urban planning

## Urban Climate and Urban planning 1

**Chairperson(s):** *Sascha HENNINGER, Martin RUMBERG*

- Climate and air quality characteristics in Moscow according to the 60- year period of measurements at the Meteorological Observatory of Moscow State University

  *Natalia CHUBAROVA, O. SHILOVTSEVA, E. GORBARENKO, I. EREMINA, P. KONSTANTINOV, I. KORNEVA,M. LOKOSHCHENKO, E. NEZVAL', E. ZHDANOVA,I. BELIKOV, A. SKOROKHOD (Russian Federation)*

- Long-term changes of the lower troposphere air temperature in Moscow region

  *Irina KORNEVA, Mikhail LOKOSHCHENKO (Russian Federation)*

- Global warming in Moscow megacity: global effect and the urban amplification of the heating

  *Alexander KISLOV, Pavel KONSTANTINOV, Mikhail VARENTSOV, Timofey SAMSONOV, Irina GORLACH and Kristina TRUSILOVA (Russian Federation)*

- Urban Heat Island research in Arctic region

  *Pavel KONSTANTINOV, Alexander BAKLANOV, Mikhail VARENTSOV, Irina REPINA, Sergey SHUVALOV, Timofey SAMSONOV, Mikhail GRISCHENKO, Antonina TODOSIEVA, Mikhail VEDISCHEV (Russian Federation)*

## Urban Climate and Urban planning 2

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- Low-cost urban-ecological survey for small settlements

  *Martin FABISCH, Sascha HENNINGER (Germany)*

- Changing Seasonality of Extreme Temperature Events and Urban Human Mortality in the Republic of Korea

  *Gwangyong CHOI (Republic of Korea)*

- Urban Heat Island and Weekly Course of Air Temperature in Moscow

  *Mikhail LOKOSHCHENKO (Russian Federation)*



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  *O.A. SHILOVTSEVA (Russian Federation)*

- Solar Power Resources of Moscow Region

  *O.A. SHILOVTSEVA, Ye.V. GORBARENKO (Russian Federation)*

- Towards the development of spatially detailed short-range chemical weather forecasting within the Moscow megacity

  *Alexander KISLOV, Anastasia REVOKATOVA, Galina SURKOVA, Gdaliy RIVIN, Alexander KIRSANOV (Russian Federation)*

- Evolution of World Cities and Adaptation to Climate Change: Historical and Current Perspectives

  *Bhuiyan M. ALAM (United States of America)*

- The climate of Zaragoza (NE of Spain) in the context of global change

  *José María CUADRAT, Miguel* Ángel *SAZ, Martín de LUIS, Ernesto TEJEDOR, Roberto SERRANO (Spain)*

- Drought and the city: challenges for the urban water management

  *Alejandra PEÑA (Mexico)*

- Local Governance In Mitigating The Urban Heat Island Effects

  *Mirela PARASCHIV, Igor SÎRODOEV, Cristina MERCIU, Nataşa* VĂIDIANU, Irina SAGHIN, Andrei SCHVAB (Romania)



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# Climate and air quality characteristics in Moscow according to the 60- year period of measurements at the Meteorological Observatory of Moscow State University

*Natalia CHUBAROVA, O. SHILOVTSEVA, E. GORBARENKO, I. EREMINA, P. KONSTANTINOV, I. KORNEVA,M. LOKOSHCHENKO, E. NEZVAL', E. ZHDANOVA,I. BELIKOV, A. SKOROKHOD (Russian Federation)*

Moscow climate and air quality conditions were analyzed according to the 60-year period of measurements at the Meteorological Observatory of Moscow State University (MSU MO) since 1954 (www. momsu.ru). A complex program of meteorological and radiadive observations as well as aerosol, air and precipitation quality measurements has been in operation at the MSU MO according to the guidelines and the standards established by WMO and Russian Hydromet Service. A significant positive temperature trend (+0,041C/ year over 1954–2013) was obtained in Moscow, which has been increased up to +0,067C/year for the 1976–2012 period. This trend is slightly larger than the rate of temperature increase in the Central Federal District (CFD) (0,059CS / year) and over the whole Russia (0,043C / year). Long-wave net radiation also undergoes a dramatic increase in the last decades. We show the possible mechanism of larger temperature increase in Moscow compared with that in the Central Federal District, which can be connected with the additional influence of greenhouse effect of the urban atmosphere. The long-term measurements of shortwave irradiance, natural illuminance, PAR and UV radiation demonstrate a pronounced decrease in the 1970s and the increase during the last decades due to changes in global scale circulation. The interannual changes in biologically active UV radiation are characterized, in addition, by the large influence of decreasing total ozone content since the end of 1980s. In 2011, for example, we observed the absolute maximum level in biologically active UV radiation (+11%) and especially high UV-B radiation in spring 2011, when the Arctic ozone hole spread over the Moscow district. A new approach has been proposed for evaluating the optimum UV level for human health. According to the estimates, in Moscow the UV optimum is observed from the middle of March to the end of April, and from the end of September to the middle October. The analysis of chemical composition of precipitation and pH since 1980, shows a significant seasonal and inter-annual variability with large frequency of acid precipitation in 1980-1990s, its significant decline in 1999-2004, and a noticeable increase - since 2005. These variations are accompanied by the change in chemical composition from sulphate to chloride dominating ions. The analysis has revealed the effects of local pollution of Moscow megalopolis and the significant role of de-icing salts in increasing the chloride ions concentration and the acidity of the precipitation. Aerosol studies since 1955 demonstrate a pronounced



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negative trend in aerosol optical thickness (AOT) since 1990s. According to the AERONET measurements the negative AOT trend is also observed in the 2000s. It is characterized by the substantial decrease in fine mode fraction. Column aerosol content as well as the surface concentrations of aerosol particles smaller than 2.5 microns (PM2.5) demonstrate a summer maximum due to the active processes of second aerosol generation. The analysis of daily average PM2.5 in Moscow shows that the excess of maximum allowable concentration was detected 4 times in 2011, 10 times - in 2012 and 31 times - in 2013. In comparison with other megalopolis areas of Eurasia and America a moderate level of gaseous air pollution in Moscow is observed. The worst air pollution provides by nitrogen oxides, which content is comparable to that in cities of the industrialized countries.



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## Long-term changes of the lower troposphere air temperature in Moscow region

*Irina KORNEVA, Mikhail LOKOSHCHENKO (Russian Federation)*

Long-term changes of the lower troposphere air temperature in Moscow region. Korneva I.A.1, Lokoshchenko M.A.1, Kochin A.V.2, Dubovetskiy A.Z.2, Kulizhnikova L.K.3 and Razin P.E.4 1Lomonosov Moscow State University. Moscow, Russia. 2Central Aerological Observatory. Dolgoprudny, Moscow region, Russia. 3Institute of Experimental Meteorology, Research and Production Association 'Typhoon'. Obninsk, Kaluga region, Russia. 4Russian Radio Television Network, Moscow, Russia. Current climate warming is detected not only at the surface air layer but also in the whole troposphere. The purpose of this work is to estimate rates of the air temperature changes at different heights in Moscow region. There are three sources of data including TV tower in Ostankino district in Moscow which has a height of 540 m; aerological station in Dolgoprudny town (on a distance 5 km apart the city) and high meteorological mast in Obninsk town having the 310 m height (located on about 100 km to the South from Moscow). The dynamics of the air temperature has been studied for the period from 1991 to 2013 at levels of 2, 121 and 301 m by the data of high mast in Obninsk; at 2, 128, 305, 385 and 503 m by the data of TV tower; and from 2 to 4000 m by the data of radiosondes in Dolgoprudny. As a result of analysis, a total increase of the mean-annual air temperature has been detected at all heights everywhere during last a quarter of century. The growth of mean-annual air temperature was equal to 0.06-0.13 °C/year. A warming in the lower troposphere for this period was more intensive in Dolgoprudny (close to the Northern margin of Moscow) than in Obninsk. This effect can be explained by intensive rate of urbanization at Northern suburbs of Moscow city during last two decades. However, an increase of the air temperature at recent time (several last years) became slower so that a warming deceleration occurs. Besides, air temperature change in the lower troposphere is not the same during the whole year. For instance, a cooling is observed in average from January to March because of cold winters during recent years.



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IGU2015 – 1692

## Global warming in Moscow megacity: global effect and the urban amplification of the heating

*Alexander KISLOV, Pavel KONSTANTINOV, Mikhail VARENTSOV, Timofey SAMSONOV, Irina GORLACH and Kristina TRUSILOVA (Russian Federation)*

Climate change over the central part of the East European Plain has been governing by global changes of the greenhouse gases, aerosols, and regional variations of atmospheric circulation. Within large urban area, climate change (especially the warming) is amplified due to influence of sharply modified land properties. It can be characterized as the urban amplification of the heating. The focus of this paper is the climate change of the Moscow megacity, including changes of the structure of the atmospheric boundary layer, changes of the urban heat island (UHI), and determination of the microclimatic features of the local environment. Available meteorological observations within the Moscow urban area and surrounding territory allow us to assess the human-induced climate warming component separately from climate variations inherent to the whole the central part of the East European Plain. To obtain more precisely viewing on the UHI structure we have included into the analysis together with the ground observation the satellite data (Meteosat-10), providing temperature and humidity profiles with high resolution. Today, integrated climate management is an important approach for sustainable management and protection of large city areas. One of the core challenges for such successful program is the assessment of climate change impacts on the local microclimate changes as well as related socioeconomic sectors. In this context, the results of the regional climate model COSMO-CLM+TEB were used to investigate the mechanism of the urban amplification. Climate change differences between urban and rural areas are determined by changes of the shape of the UHI and their relationships with changes of building height and density. Therefore, the urban module of COSMO-CLM+TEB model is fed by information from special GIS database contenting both geometric characteristics of the urban canyons and other characteristics of the urban surface. The sources of information were maps belonging to the OpenStreetMap, and digital elevation models SRTM90 and ASTERGDEM v.2 as well. The multiscale GIS database allows us to generate such kind of information with different spatial resolution (200, 500 and 1000 meters).



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IGU2015 – 3903

## Urban Heat Island research in Arctic region

*Pavel KONSTANTINOV, Alexander BAKLANOV, Mikhail VARENTSOV, Irina REPINA, Sergey SHUVALOV, Timofey SAMSONOV, Mikhail GRISCHENKO, Antonina TODOSIEVA, Mikhail VEDISCHEV (Russian Federation)*

Urban Heat Island effect and its characteristics is one of the main research directions in modern urban climatology. Of course, its characteristics differs in different climate zones, and by this moment, there is only a few papers about UHI (Magee et al, 1999) in high latitudes, for the cities over the Polar Circle and especially about behavior of the heat islands during the polar night, while anthropogenic heat is the main source of thermal energy. The main goal of this study is partly describe climatology of UHI formation in big cities of Arctic zone. In 2013-2014 we led complex experimental research of the Urban Heat Island (UHI) of 4 biggest Arctic Cities (Murmansk, Norilsk, Apatity and Vorkuta), which were obtained during 5 expeditions of Russian Geographic Society. This investigations allowed to collect unique data about UHI in high latitudes. Analysis of the collected data showed the existence of UHI with the difference between city center and surrounding landscape up to few degrees Celcius (up to 5-7 in Norilsk). UHI characteristics in view of synoptic conditions was analyzed for several typical situations, for some cities (Norilsk) the negative correlation of the UHI power with air temperature was determined. Also potential cost of 1C degree error for UHI prediction in municipal heat production systems was evaluated: in Apatity – 686 mWt (1000€ per day), in Norilsk - 2691 mWt (3900€ per day) The reported study was supported by RGS (Russian Geographical Society ), research project No.27/2013-NZ



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IGU2015 – 1848

## Low-cost urban-ecological survey for small settlements

*Martin FABISCH, Sascha HENNINGER (Germany)*

Human health is strongly influenced by urban climate. If environmental conditions are altered by humans, this could have a direct impact on the local climate. Especially, within large cities this local climate is particularly pronounced. For example, this could lead to urban heat islands, which can amount up to 10 K for urban agglomerations. In addition to this, there is also an extensive effect on the local wind field, the air pollution as well as on the urban water balance. A large-scale study of these urban climate effects is only possible through expensive empirical surveys or complex modeling. For this reason, most of the urban climate studies were located in big cities. But even in small settlements, the local climate has a negative impact on the wellbeing and health of the people. It is necessary to analyze the local conditions to accomplish an ecological settlement development. The currently used low-cost methods (e.g. aerial photo analysis or simple computer modeling) usually provide only insufficient reliable and detailed results. The method to detect urban climate relevant indicators delivers first approaches to identify potential problem areas. However, many of these indicators offer their full effect only in combination with other indicators. A high degree of soil sealing can lead to a thermal load range, but only in conjunction with a high surface roughness, and the resulting severe air exchange, the formation probability of an urban heat island rises considerably. Two different indicators have to be combined in a matrix to capture these relationships and to obtain detailed and reliable data for the corresponding investigation area. Thus, the probability of occurrence of each urban climate phenomenon can be estimated as a function of the used indicators. The knowledge gained can be used to identify problem- and potential-areas of a settlement.



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# Changing Seasonality of Extreme Temperature Events and Urban Human Mortality in the Republic of Korea

*Gwangyong CHOI (Republic of Korea)*

In this study, the 100-year history of heat waves and cold surges in the Republic of Korea and their impacts on urban human mortality were examined. In the context of climate change impact assessment, the weakened Siberian high pressure system and the strengthened East Asian summer monsoon front in recent decades have led to the seasonal asymmetric changes in urban human mortality in Korea. Unprecedented summer extreme hot episodes (e.g. 1994 East Asian heat waves) in recent decade resulted in higher elderly mortality rates in the metropolitan districts with less green space than those in the surroundings. These results indicate that the sustainable management of urban vegetation covers is needed to reduce the vulnerability of sprawling future cities with increasing aging population to frequent intense hot events in the warmer 21st century. Key words: urbanization, heat waves, human mortality, vulnerability, extreme climate change.



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# Urban Heat Island and Weekly Course of Air Temperature in Moscow

*Mikhail LOKOSHCHENKO (Russian Federation)*

The urban 'heat island' as a climatic phenomenon exists almost everywhere except only specific geographical conditions of dry tropical deserts. Any city and even any village usually create 'heat islands' which intensity depends on a city area, population, urban heat sources, type of climate, etc. In Moscow the continuous meteorological measurements were started in 1779. However, firstly it was the only station in the city. The urban 'heat island' in Moscow region may be studied since 1880s when a network of ground meteorological stations was created. Besides a traditional intensity of the UHI (i.e. averaged in time difference between the air temperature in the city centre and outside the city), one more additional parameter – so-called 'areal' UHI intensity – is useful as well. It represents a value averaged both in time and in space (a difference between mean air temperature in the city area and outside the city). The traditional intensity of the urban 'heat island' in Moscow was nearly of 1.0-1.2 ºC at the end of the XIX century, 1.2-1.4 ºC one century ago and 1.6-1.8 ºC both in the middle, and at the end of the XX century whereas the 'areal intensity' was equal to 0.8-0.9 ºC both in the middle, and at the end of the XX century. Thus, during several last decades both parameters remained nearly the same in spite of continued growth of the city. The probable cause is that the urban growth seems to be extensive now so that the urban saturation and density of heat sources in the city centre changed only a bit during last half of the century. In the diurnal course the 'heat island' intensity in Moscow is maximal usually at night. The maximal 'heat island' intensity in Moscow may reach up to 14 ºC, usually at night or in the early morning in anticyclone conditions. Weekly course of the air temperature T in Moscow is closely connected with the urban 'heat island' phenomenon. In average of last 50 years a gradual increase of T during week-days and sharp decrease (cooling) on weekends has been detected in Moscow. The difference between T at the end of working week and on Sunday or Monday is equal to nearly +0.25 ºC in average of a year; +0.35 ºC in cold season (from November to March) and +0.45 ºC at night (at 03 a.m.) in cold season. This difference may be explained by industrial haze and plumes from smoke stacks which are gradually accumulated from Monday to Friday and reduces effective nocturnal radiation in the city, especially during winter nights.



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# Light Resources of Moscow

*O.A. SHILOVTSEVA (Russian Federation)*

The results of long-term (1964-2014) monitoring of the earth surface natural illuminance in Moscow are presented. Daily course of the total, direct and diffuse illuminance throughout the year under clear sky and cloudy conditions is analyzed. The evaluation of the impact of various climatic factors (surface albedo, cloudiness and atmosphere turbidity) on the illuminance daily course is given. The estimates for day light variability are given. Based on the results of observations the time of onset critical light conditions and period of use of natural light in the design of lighting in buildings in Moscow region are calculated. The first results of monitoring of illuminance coming to the various oriented vertical surfaces are presented.



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## Solar Power Resources of Moscow Region

*O.A. SHILOVTSEVA, Ye.V. GORBARENKO (Russian Federation)*

The resources of solar radiation with current climate change in the Moscow region are evaluated. Investigations were carried out on the basis of long-term (1954-2014) actinometric measurements in Meteorological Observatory of Moscow State University. Regime and variability of the total radiation in cloudless and cloudy atmosphere and the meteorological parameters defining them (cloudiness and sunshine duration) have been analyzed. It is shown that the potential of solar energy in the Moscow region is suitable for use from April to September, the most effective period from May to July. Analysis of trends in long-term variability of total radiation indicates an increase in solar power resources in Moscow and region in early of the XXI century.



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# Towards the development of spatially detailed short-range chemical weather forecasting within the Moscow megacity

*Alexander KISLOV, Anastasia REVOKATOVA, Galina SURKOVA, Gdaliy RIVIN , Alexander KIRSANOV (Russian Federation)*

Atmospheric pollution in the cities is constantly increasing. It makes air pollution forecast extremely important for modern meteorology. Short-range spatial detailed forecast of air pollutants distribution should be done as a part of weather forecast. We realized operational method of air pollution forecast in the case of strong fire's emissions during memorable summer of 2010 year, when many wild fires took place around the Moscow due to catastrophic weather conditions. Vegetation type and emissions factors for different pollutants were taken from special database. Fire areas were detected based on satellite information. Future pollutant concentrations were calculated based on chemical-transport model COSMO-ART (https://www.imk-tro.kit.edu/english/3509.php). In our research we developed the method of emission estimation with high spatial resolution (several km) based on data of automatic measurements network, covering the urban area of Moscow and surroundings. Our method gives an opportunity to get "online" emissions for certain day. We applied our technology to calculate carbon monoxide (one of the most dangerous pollutant) emissions. Around 90% of CO in Moscow is emitted by traffic. CO emissions were calculated for different seasons and showed adeqate spatial and temporal distributions. Obtained emissions were compared with traditionally-utilized TNO emissions dataset and show an agreement to an order of values. Calculated CO emissions were used in the model system COSMO-ART for 24-hours CO concentration forecast; model results showed good agreement with observations. Our result show that usage of emissions calculated by proposed method inproved forecast compare to forecast based on traditionally utilized the TNO data. A pilot version of the operational forecast system focusing on the CO within the Moscow megacity has been developed.



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**Evolution of World Cities and Adaptation to Climate Change: Historical and Current Perspectives**

*Bhuiyan M. ALAM (United States of America)*

Starting from the rise of ancient Mesopotamia to the decline of today's Baghdad, cities have vivid histories attached to them. Cities emerge, prosper and decline following some stages throughout their lifetimes. The population of cities throughout the world, specially the mega cities, also coined as World Cities, has increased manifold compared to their rural counterparts in the recent past. This paper examines how and why cities emerge, grow, and decline in particular ways. The paper provides introductory knowledge to the academic audience about the historic evolution of cities, their gradual growth towards transforming to World Cities, their current conditions, interactive city-human dependence, and the innovative techniques humans have had followed to adapt to climate change to live in the massive World Cities. The paper focuses on those World Cities that are forecasted to be seriously impacted by climate change, i.e., cities like New Orleans (USA), Dhaka (Bangladesh), Kolkata (India), Jakarta (Indonesia), and such. The major objectives of the paper are two-fold: i) to enrich the discipline of adaptation to climate change as it pertains to geography and urban/city planning/studies, and ii) fill out the gap that exists due to scarcity of literature that discuss the city-human dependence and the techniques adopted by humans to adapt to climate change from historic and current perspectives. Since the paper focuses on both historic and current perspectives of urban/city complexity and adaptation to climate change, it perfectly fits to the theme of IGU Regional Conference to be held in Moscow, Russia, in 2015.



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**The climate of Zaragoza (NE of Spain) in the context of global change**

*José María CUADRAT, Miguel* Ángel *SAZ, Martín de LUIS, Ernesto TEJEDOR, Roberto SERRANO (Spain)*

The IPCC 2013 (AR5) emphasizes that the impact of an increase in temperature will be compounded in large cities by the effect of the urban heat island. Therefore, it suggests the need to study the urban climate in urban planning to anticipate changes and define adaptation strategies. The aim of this work is to analyze recent trends in temperature in the city of Zaragoza (NE of Spain, 750,000 inhabitants) and the extreme values from climate indices defined by the WMO. Daily temperature data recorded at 10 observatories located in Zaragoza was homogenized and quality-controlled using 'HOMER, R-Package', developing a single daily series since 1892 to present. Temperature records show a clear positive trend since the early 80s of 20th century. The first decade of the 21th century is the warmest since the beginning of the instrumental records. There is an increase of +0.07 °C per decade. Furthermore, the temperature rise in this period has been +1.6 ° C. The frequency of tropical nights has also been increased. The number of nights when the minimum temperature was not lower than 20 °C has moved from 89 in the period 1900-1930 to 386 in 1991-2010. Days when the maximum daily exceeds 35ºC are also more frequent. Regarding the cold events, there is a decrease in the number of days with temperatures below 0 °C. These results reinforce the idea of the IPCC that the challenges of climate change should be recognized as fundamental elements for urban planning in order to reduce risks and promote the welfare of citizens, as well as an instrument to minimize vulnerability and identify ways to maximize opportunities.



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**Drought and the city: challenges for the urban water management**

*Alejandra PEÑA (Mexico)*

Water supply in Mexican cities is highly vulnerable if we consider, on the one side, the low efficiency operation of the formal suppliers (municipal), and on the other, the complex overlapping local and communal strategies of water supply provision in urban areas. In contexts of drought, the supply of water faces challenges that could hardly be confronted, even in cities where the provision of water seems to have acceptable standars. For that, droughts in cities need to be analyzed to prepare strategies to cope with it, considering the complex reality mentioned above. Preventive planning needs to include not only technical decisions, but also a variety of communicative tools to make people aware on what drought means in urban spaces, due to the relation of society and its environment is not necessarily aware and visible, and due to the variety of realities presented in Mexican cities in relation to water supply. From a combination of risk studies and urban geography, the work then aims to analyze the production of drought in urban spaces related to water supply. It highlights the need to consider the complexity range of forms of provision of water within the cities. It revises the current public policy on drought and analyses on the importance of communication and education on drought on social actors, as a way to prompt participation and positive responses such as change in water consumption habits.



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**Local Governance In Mitigating The Urban Heat Island Effects**

*Mirela PARASCHIV, Igor SÎRODOEV, Cristina MERCIU, Natașa* VĂIDIANU, Irina SAGHIN, Andrei SCHVAB
(Romania)

Urban climate characteristics represent a constant problem for the territorial planning and sustainable development of cities as they have a significant impact on the quality of urban life. In direct relation with the built environment, urban climate frequently results in such a phenomenon as the urban heat island. Bucharest, the 6th largest city in the European Union, faces the urban heat island effects in the context of a highly dense built-up space. The study carries out a qualitative assessment of the policies and actions implemented by the local public and private actors for mitigating the impact of the urban heat island on the quality of urban life. Our analysis is based on interviews with the representatives of several institutions involved in policy implementation; field observations to investigate the evidences of measures and actions taken at city or community level to deal with the increased temperatures; questionnaires applied on a relevant number of Bucharest residents to highlight their level of satisfaction with the implemented policies. Our outcomes were correlated to evidence the specificity of Bucharest local governance in mitigating the challenges of urban climate extremes and the territorial differentiation associated. The main findings of the research argue that the urban heat island effects are dealt within a territorially fragmented and unsustainable framework of local governance. Our paper shares the Romanian experience related to mitigating the urban climate extremes and it suggests useful insights for the urban planners and policy makers to optimize urban governance policies in order to increase the quality of life of the urban dwellers.



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# Urban geography of arts: the co-production of arts and cities

## Urban geography of arts: the co-production of arts and cities 1

**Chairperson(s):** *Pauline GUINARD, Géraldine MOLINA*

- L'art aux frontières dans l'espace israélo-palestinien

  *Clémence LEHEC (Switzerland)*

- La géographie de la littérature, ses navigations intra et extradisciplinaires : théories, méthodes, apports

  *Géraldine MOLINA (France)*

- L'espace entre sons et images : métropoles à l'œuvre

  *Bertrand PLEVEN, Séverin GUILLARD (France)*

- The cinema industry as factor of the socio-economic development of the territory

  *Ekaterina BELOVA (Russian Federation)*

- La part visible. Les galeries d'art comme marqueurs de l'activité artistique et des transformations urbaines

  *Tatiana DEBROUX, Camille BOICHOT (Belgium)*

## Urban geography of arts: the co-production of arts and cities 2

**Chairperson(s):** *Pauline GUINARD, Géraldine MOLINA*

- Public Art in the Socially inclusive City

  *Ronan PADDISON (United Kingdom)*

- Art and urban project

  *Marie Kenza BOUHADDOU, Clotilde KULLMANN (France)*

- Art as a new urban norm: between normalization of the city through art and normalization of art through the city

  *F. COSTA; Pauline GUINARD, Antonin MARGIER (France)*



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# L'art aux frontières dans l'espace israélo-palestinien

*Clémence LEHEC (Switzerland)*

Dans la lignée de mes recherches de Master, mon travail de doctorat entend questionner la réception de l'art dans le contexte israélo-palestinien. Plus particulièrement, en prenant le cas de l'objet frontière. L'interaction entre art et frontière permet de poser la question d'un éventuel déplacement réciproque de l'un et de l'autre des termes de l'équation, notamment lorsque la frontière devient un canevas directement investi par l'art. Je propose d'étudier cette question en constituant un laboratoire méthodologique qui, mettant à l'épreuve du terrain un protocole de recherche, permettrait de saisir cette interaction. En effet, cet aller-retour qui s'opère entre monde matériel et individu percevant définit le processus de production de l'espace qui institue simultanément espace et individu. L'art aux frontières est donc une déclinaison particulière de la production de l'espace qui doit être étudiée comme un processus. Il me semble alors nécessaire de partir de l'étude de structures matérielles où le dispositif spatial entre objet et spectateur est planifié (par exemple : étude du nouveau musée de Palestine, qui ouvrira à Ramallah, échelle architecturale) pour atteindre l'étude des sensations, des émotions qui envahissent le spectateur au contact des objets d'art. Je m'intéresserai donc aussi bien au dispositif spatial matériel que symbolique de cette interaction. Enfin, adoptant une démarche d'expérimentation méthodologique qui place la coproduction au cœur de la construction du savoir géographique, je postule qu'il est nécessaire de se situer à l'échelle du corps des individus qui pratiquent les frontières et perçoivent/instituent l'art en tant que tel.



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# La géographie de la littérature, ses navigations intra et extradisciplinaires : théories, méthodes, apports

*Géraldine MOLINA (France)*

La « géographie de la littérature » (Brosseau, Cambron, Molina 2010; 2014b) actualise pour un objet spécifique, la littérature, une démarche de « géographie de l'art » (Grésillon 2008; Guinard 2009; Vivant 2007; Volvey 2008). Elle analyse les phénomènes de production, d'appropriation et d'utilisation des œuvres littéraires, les espaces et groupes sociaux qui leurs sont associés. Elle place ainsi au cœur de la réflexion le triptyque espace-société-littérature, les processus de co-fabrication entre ces trois objets. Cette contribution vise à ouvrir une perspective réflexive sur ce champ de recherche récent qui a principalement investi des terrains urbains. Il s'agit ainsi d'alimenter un dialogue sur les enjeux épistémologiques et heuristiques, les outils mobilisables par la géographie de l'art. Comment penser les questions de la singularité de la géographie de l'art, ses enrichissements extra et intradisciplinaires (transfert, complémentarité, distinction avec d'autres disciplines) ? Sur quels théories, concepts, méthodes cette géographie de la littérature s'est-elle appuyée ? Plus précocement et moins timidement que la géographie, la critique littéraire et la sociologie de la littérature notamment se sont attachées à analyser l'objet littéraire en précisant leurs angles d'attaque, leurs apports (théoriques et méthodologiques) et leurs légitimités disciplinaires à s'en saisir. Comment la géographie de la littérature s'en est-elle inspirée et distinguée ? Sur quelles spécificités reposent ses apports théoriques et méthodologiques ? Quelles ont été les ressources mobilisées et les pierres d'achoppement rencontrées dans ce cheminement ? Quels nouveaux chantiers pour la recherche ce bilan ouvre-t-il ?



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## L'espace entre sons et images : métropoles à l'œuvre

*Bertrand PLEVEN, Séverin GUILLARD (France)*

La présente communication se propose de penser les mutations urbaines contemporaines à hauteur d'œuvres, à savoir, fictions cinématographique et musique rap. C'est ainsi l'occasion de discuter de la « crise de la figuration de l'urbain », de son irracontabilité supposée en travaillant les modalités par lesquels les œuvres sont (toujours) en mesure de produire un imaginaire sur la ville. Les objectifs sont les suivants: Présenter deux sous-champs disciplinaires (géographie et cinéma, géographie et musique) en pointant focales et problématiques différentes, d'une part, mais aussi en posant les questionnements, démarches, concepts communs. Autour de l'urbain contemporain et à la lumière de ses supports différents, il s'agit ainsi de circonscrire un espace de dialogue validant un champ partagé relevant de la géographie des Arts dans leur diversité. Interroger les multiples dimensions par lesquelles les œuvres artistiques peuvent raconter la ville en s'interrogeant sur les dimensions multiples contenues dans les œuvres cinématographiques et musicales. Montage entre textes, sons, paroles, bruits et images, cinéma et rap sont deux modalités de figuration de l'urbain qui définissent des sphères de perceptions et donc des imaginaires différents mais en bien des aspects comparables. Arpenter un corpus corpus de films de fiction et de clips afin de définir d'éventuels échos entre des sphères de perception/expression produit par les formes de montages sons/images dans les récits contemporains. Il s'agira de présenter une méthodologie hybride associant études visuelles et sonores, dimensions spatiales de la musique et de l'image. Celle-ci permettra aussi de mesurer les circulations conjointes entre et au sein de ces deux formes esthétiques et poreuses que sont les clips et les films et ainsi de sortir d'analyses uniquement internalistes.



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## The cinema industry as factor of the socio-economic development of the territory

*Ekaterina BELOVA (Russian Federation)*

My research is devoted to the geographical interpretation of the images of two american cities (New York city and Chicago) in the national cinematography. The work is based on the study of movie locations, the areas in which they are combined and on it's zoning by the disposition from the city center. The theme of my work unites two branches of geography: cultural geography and urbanism. There are different works devoted to the image of city and to geography in cinema. But the studying of inner structure of the city image by analyzing movie locations took place in none of them. We invented different tools of analyses in order to determine the image of the city in cinema. First, we choose films to analyze it's locations. Then we make a map of movie locations and draw the areas in which they combine. Also we identify the most popular movie locations and compare it with popular tourist's attractions. Other part of the work is related to the formation of distance grid. We have created the schemes of zoning to show how different neighborhoods take part in the formation of the cities' image. The present study shows the new method of research of the cities image in cinematography. The importance of this work lies in its practical applicability. The new method introduced in this work can be applied to the study of any city (where the movies were filmed) and also to different territorial purposes. Moreover this approach can help to popularize geographical science.



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## La part visible. Les galeries d'art comme marqueurs de l'activité artistique et des transformations urbaines

*Tatiana DEBROUX, Camille BOICHOT (Belgium)*

Des travaux récents ont été consacrés aux galeries d'art et à leur spatialité : ils interrogent essentiellement la globalisation du marché de l'art ou l'existence de clusters de galeries. En raison de leur nature particulière, marchande et symbolique, les galeries sont porteuses de logiques spatiales propres mais elles sont aussi inscrites dans des dynamiques artistiques et urbaines plus larges, dont elles peuvent être des révélateurs. A travers une analyse empirique (Paris, Bruxelles), nous tracerons d'abord une géographie des galeries, interrogeant ses facteurs, ses permanences et ses variations. La visibilité de ces lieux sera ensuite questionnée, suivant les espaces urbains investis (zones touristique, commerciale, résidentielle ou en marge) mais aussi en ce qui concerne leur morphologie architecturale. Vastes espaces éclairés donnant sur la rue, les galeries marquent la ville par leur présence, rendant perceptible la création artistique et mettant en lumière certains quartiers. Ceux-ci sont-ils identiques à la répartition des artistes, dont la présence serait ainsi révélée ? Nous interrogerons finalement les liens entre activité artistique et gentrification, confrontant la répartition des galeries à l'extension des processus de rénovation résidentielle et commerciale. Les galeries et leurs logiques spatiales rejoignent aujourd'hui les desseins des pouvoirs publics : mise en spectacle de l'art, esthétisation de l'espace, confèrent à une élitisation et marchandisation des centres-villes, auxquelles participent les galeries. Nous référant à la littérature existante, nous mettrons en évidence des particularités locales, tout en repositionnant cet objet d'étude singulier dans une perspective critique plus vaste, liée à la recomposition des territoires urbains.



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## Public Art in the Socially inclusive City

*Ronan PADDISON (United Kingdom)*

Public art - as for the arts more broadly - has become closely implicated with the regeneration of cities. The frequency with which public art has become employed in the reinscription of public spaces is matched by the different objectives sought for it - as urban decoration, as a physical intervention commemorating past events, as a visual statement appealing to the multiple identities and social relationships defining the city and its history. The multiplicity of objectives invoked for public art problematize its meaning and purpose - specifically how public art is able to address the everyday life of the city. Key here is how public art addresses the wider project of building inclusive cities. How can public art meaningfully enhance social inclusion? How can such a goal be assessed? What are the methodological problems in assessing how public art is socially inclusive? To the extent that its use has become part of the project of reimagining and regenerating cities and city spaces how can public art be installed in democratic ways that contribute to social inclusion? This paper draws on the experience of installing public art in the regeneration of Glasgow. Rooted in the reimagining of the city, its visual reinscription of the city has become closely identified with the use of public art. The paper focuses on how public art was installed within a regenerated inner city, socially mixed neighbourhood and the problems encountered in the goal of achieving socially inclusive outcomes in a diverse city space.



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## Art and urban project

*Marie Kenza BOUHADDOU, Clotilde KULLMANN (France)*

For 15 years now, the question of using art within the urban projects has been working as a channel to highlight the urban transformation processes and also to respond to social, economical and political matters. Firstly, we will analyze Prenez Racines ! (Take Roots ! ), where art is used as a social bond creator and as a way to allow participation. It is about an experiment launched in 2009 by the artist Thierry Boutonnier in the 8th District of Lyon. The project takes the form of a tree nursery ruled by the inhabitants of a neighbourhood that has been restructured. The trees are planted, treated and then transplanted to the renovated neighbourhood meanwhile the inhabitants are relocated. Then, we will then study the In Situ exhibition, dedicated to street art. It took set in the Fort of Aubervilliers in Seine-Saint-Denis in 2013, before the renovation of the site. During the summer, visitors were invited to enter and discover the inside of this enclosed industrial site where 40 artists have performed. What does the artistic performance means to the urban project in terms of representation but also in terms of transforming the involved actors system? Why call on artists in such cases? First, we will analyze the way art allows us to understand the urban project's complexity. Then, we will see how these kinds of projects are receipted by the audience and how the audience participates. Finally we will study the way the artistic projects can be means to take hold of the transforming city.



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## Art as a new urban norm: between normalization of the city through art and normalization of art through the city

*F. COSTA; Pauline GUINARD, Antonin MARGIER (France)*

In a context of increased urban competition at a global scale, cities need to be attractive (Miles 1997). In this regard, art and culture have become specific tools to produce the city. Being at once material and symbolic, art is favoured for its capacity to improve the urban image. As such, we will argue that art has become a new norm within this urban competition. In this process, art is not only becoming an urban norm, it is also both normalizing and normalised. Art that is installed in urban space, and more particularly in its public spaces, is indeed inclined to "artialize" the urban landscape (Roger 1997; Paquet 2009). Consequently, this artialization is likely to diffuse norms through what Allen names "ambient power" (2006). By creating a specific atmosphere associated to the positive values of inclusion and creation, art could encourage and induce some behaviours or, on the contrary, reduce and discourage others. Finally, this normative structure could impact art itself and redefine the unstable limit between artistic forms that are inclusive or exclusive (Hall et Robertson 2001), "in" or "off" (Vivant 2006), dominant or subversive (Guinard 2014). Through examples from our fieldworks in Johannesburg, in the Ruhr region and in Montreal, we'll show that this normalization of the city through art and of art in he city takes place in different urban contexts, questioning the very distinction between Northern and Southern cities, as well as the definition of the city itself.



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# Urban Governance and Inclusive Cities in India

**Chairperson(s):** *Tapash BISWAS*

- Global City, Neoliberal Urbanism and Social Exclusion: Urban Question in Millennial Delhi
  *Dhiraj BARMAN (India)*
- Role of Urban Governance for Indian Cities
  *Tapash BISWAS, Ashok Kumar SAHAY (India)*
- Housing, Slums and Urban Poverty Alleviation in a Turbulent State: A case of Srinagar Town in Jammu & Kashmir, India
  *Manoj Kumar TEOTIA, Rajender KUMAR, Sachna ARORA (India)*
- Role Of Nodal Centres In Socio-Economic Development Of Guwahati Region
  *Jayasree BORAH (India)*
- Urban Challenges: Integrated Urban Planning for social inclusion and resource management
  *Daljeet KAUR, Sanjay TRIPATHI (India)*



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## Global City, Neoliberal Urbanism and Social Exclusion: Urban Question in Millennial Delhi

*Dhiraj BARMAN (India)*

The third world megacities represent essential contradictions with its northern counterpart. Global city has become a strong meta-narrative for the third world urban policy makers in present globalising world. Global city largely means making beautiful city with global investment potentials. It largely embodies neoliberal urbanism; where gentrification and social exclusion held to be important strategies of it. Like many third world cities capital Delhi also became a prime site of such hyper urbanism processes. Global city as a western mode of urban development cannot be panacea for emerging economies; rather it is highly exclusionary in nature. In Delhi's context such urbanism processes are going at a faster rate through ignoring many other social development issues. The real-estate is booming and rampant slum evictions have taken place. The government policies in recent past are trying to overlook the priorities for the common citizen; different exclusionary methods are being used to keep away the unwanted social class from the city through gradual withdrawal of civic amenities and regularising urban social landscape. The objective is mainly to understand the neo-liberal urbanism process. The study tries to engage with emerging urban theories like new urban policy, hyper urbanism; while validification of these concepts will be based on different secondary data and narratives collected from the field as well as other published sources. [Key words: Global City, Social Exclusion, Gentrification, Neoliberal Urbanism]



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## Role of Urban Governance for Indian Cities

*Tapash BISWAS, Ashok Kumar SAHAY (India)*

The Inclusive Cities initiate the norms of good urban governance to promote equitable growth. Further phases of this initiative will involve greater capacity-building and networking, including growing collaboration and support from Habitat programme and partner initiatives. Promoting inclusiveness is not only socially just, but is good for growth and central to sustainable urban development. Inclusive urban governance means reduces inequality and social tension; incorporates the knowledge, productivity, social and physical capital of the poor and disadvantaged in city development; Increases local ownership of development processes and programmes. The authors propose a participatory design process based on three criteria: functionality (design that incorporates the needs of all types of individuals), context sensitivity (harmony with the surrounding environment), and equitable impact to "mitigate the social and human impacts especially on the most vulnerable members of society". Five quality dimensions in the concept of sustainable area development: social quality, environmental quality, economic quality, spatial quality and process quality. Combining the strengthening of environmental and nature values with enhancing the accessibility of rural areas and offering high quality job opportunities. Given the different aspects and interests this can only happen through a participative process, with all the stakeholders involved. Managing multi-functionality, multi-ownership and multi-stakeholders is considered as the key to the success of sustainability policies. Sustainability and inclusiveness need the involvement of all stakeholders. Public authorities traditionally had the leading role in land use planning. Sustainable development asks for combining different qualities and realizing synergy. Especially the creation of job opportunities in the urban fringe zone is an important issue.



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# Housing, Slums and Urban Poverty Alleviation in a Turbulent State: A case of Srinagar Town in Jammu & Kashmir, India

*Manoj Kumar TEOTIA, Rajender KUMAR, Sachna ARORA (India)*

Srinagar, the summer capital of turbulent state of Jammu and Kashmir has experienced degeneration in housing due to uncontrolled urbanisation, emergence of large number of slums with concentration of urban poverty and inadequate efforts at local level to provide housing to the poor. The urban governance is weak due to lack of institutional, legal, functional and fiscal empowerment of Srinagar Municipal Corporation. A recent study by the authors highlights that absence of strong local governance and urban development policies, lack of proper system of devolution to the third tier of governance, poor rate and base of taxes, absence of house tax/ property tax and user charges from water supply and sewerage etc, prevalent culture of freebies, growing non plan expenditure, lack of implementation of fiscal reforms under JNNURM along with poor institutional mechanism are some of the factors responsible for poor implementation of schemes/ programmes for housing, slum development and poverty alleviation. Housing for the poor has been acquiring serious dimension in the wake of rapid urbanization, inadequate efforts for slum development and poverty alleviation, weakening of public sector housing provision, commodification of land and housing and distortion in land markets in post liberalisation period. It is affecting quality of life in the city which has huge slum population and people below poverty line. The paper is an effort to look in to emerging issues relating to housing, slum development and urban poverty alleviation.



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## Role Of Nodal Centres In Socio-Economic Development Of Guwahati Region

*Jayasree BORAH (India)*

ROLE OF NODAL CENTRES IN SOCIO-ECONOMIC DEVELOPMENT OF GUWAHATI REGION The role of service centres in socio-economic upliftment of the backward areas needs no emphasis. they act as a liaison between the large urban centres and the neighbouring rural areas. The present work incorporates the spatial aspects of nodal centres in Guwahati region. The centre plays a significant role in development of rural areas, and therefore their identification, delineation of zone of influence and functions are important part in micro level planning. For the present study, both empirical and theoretical approaches are made. The secondary data related to the problem are collected from various official records, census & publications. Information relating to other activities & influence of the nodal centres are collected from the field with the help of a survey schedule. Next for identifying different orders of service centres & to delineate their zone of influence, different statistical techniques & models are used. The centres thus identified will study to assess their role in socio-economic development of the guwahati's neighbouring areas. The present study will not help development of the backward rural areas, but will also help to check the rural-urban migration which is the main cause of unscientific growth of Guwahati city.



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## Urban Challenges: Integrated Urban Planning for social inclusion and resource management

*Daljeet KAUR, Sanjay TRIPATHI (India)*

Across the developing world, governments are faced with a triple dilemma. They need to reduce poverty and create opportunities for generating jobs and incomes for their constituents. They need to manage natural resources, whether abundant or scarce, with a view to equity of access and sustainability of the environment. And they need to confront conflicts and tensions between different sectors of the economy, namely agriculture, industry, commercial services and the residential sector. These challenges are particularly prominent in India, because unlike the linear development trajectory of advanced economies, all sectors are expected to grow simultaneously. Integrating energy, environment and water concerns – as crucial inputs in development strategy – is not a choice but an imperative for inclusive development of urban and peri urban in India. Two premises underline the need for integrated plans. First, in many cases policies are not developed with a holistic view of the tradeoffs and interconnections between different issue areas. Energy, environment and water are intricately linked and crucial for sustainable development. So far, however, much of the policy response and investment flows within India have treated these as mutually exclusive areas. Development priorities have focused on growth without attention to sustainability. The second premise is that there is an opportunity to deploy new technologies and institutional mechanisms across India. India needs hundreds of billions of dollars of infrastructure investment over the coming decades. The quality of that infrastructure and the management of India's natural resources will depend on access to technology and reduced technology risk, innovative finance, new institutional structures, regulatory reform, and human resources with the skills to perform the necessary tasks. Integrated plans on energy, environment and water could help to identify the opportunities and explore pathways that allow states to achieve multiple objectives of growth, job creation, social inclusions, poverty alleviation and resource management.



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# Urban-rural Transformation in the Euro-Asian Continent

## Urban-rural Transformation in the Euro-Asian Continent 1

**Chairperson(s):** *Yansui LIU, Hans WESTLUND*

- Modelling of urban land expansion in China – A Case Study of the Pearl River Delta
  *David KARACSONYI, Chang KANG-TSUNG, Chen JIANFEI (Hungary)*
- Comprehensive analysis of hollowing villages in China
  *Yansui LIU, Yuheng LI (China (Beijing))*
- Revitalizing the decaying countryside: The Chinese and Swedish experiences
  *Yuheng LI and Hans WESTLUND (China (Beijing))*

## Urban-rural Transformation in the Euro-Asian Continent 2

**Chairperson(s):** *Yansui LIU, Hans WESTLUND*

- Analysis of Dynamical Mechanism of Rural Transformation Development in Typical Regions of China
  *Hualou LONG (China)*
- Northern Night Lights: Using Satellite Imagery to Track the Growth and Decline of Arctic Cities from 1992-2012
  *Mia BENNETT (United States of America)*
- Spatio-temporal pattern of China's rural development: A rurality index perspective
  *Yurui LI, Hualou LONG, Yansui LIU (China)*

# POSTER EXHIBITION

- Anti-Growth Machine-Indemnity Housing Projects of Guangzhou
  *Lachang LYU, Ran LIU (China)*



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**Modelling of urban land expansion in China – A Case Study of the Pearl River Delta**

*David KARACSONYI, Chang KANG-TSUNG, Chen JIANFEI (Hungary)*

It has been reported that, from 1970 to 2000, China had the highest rates of urban land expansion in the world, ranging from 13.3% for the coastal areas to 3.9% for the western regions annually. Although China accounts for less than 20% of the global urban population at present, close to one third of the global urban population growth between 2000 and 2010 was realized in China. The Pearl River Delta is an ideal area for studying urban land expansion in China. With scattered small villages in the 1970s, it is now one of the most populated and developed regions in China. Our study proposes a new index, ratio of new urban land to the total area, for analyzing the process of urban sprawl. The index combines the measures of urban expansion intensity and urban land ratio, two conventional measures of urban sprawl in the literature. The index can trace the different stages of urban sprawl, with a strong intensity and a low ratio at the early stage and a weak intensity and a high ratio at the late stage. Additionally, the index can be correlated with population growth data to separate older and more established urban areas from younger and more dynamic urban areas. Thus, the index when used with a multi-temporal land use database can offer an opportunity to check the process of urban land expansion and its demographic and socio-economic drivers.



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## Comprehensive analysis of hollowing villages in China

*Yansui LIU, Yuheng LI (China (Beijing))*

Hollowing villages have emerged in China in recent decades when the country is undergoing fast socio-economic transformations. The once self-sufficient villages become hollowing and decaying in many places of rural China. Hollowing villages which are manifested as "outward expansion while inside hollowing", consist of many adverse aspects such as residents outflow, arable land loss, infrastructure shortage and rural social problems. This phenomenon actually goes against the ultimate purpose of the construction of new socialist countryside in China. Based on the field studies of 20 typical villages in Yucheng, Shandong Province, the paper aims to provide comprehensive analysis of hollowing villages in China. It focuses on geographic interpretation of the evolving process, spatial pattern and driving forces of hollowing villages within China's current transformation process. What the paper reveals is the joint impact of household registration system, rural land-use system and urbanization policies on the hollowing villages.



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**Revitalizing the decaying countryside: The Chinese and Swedish experiences**

*Yuheng LI and Hans WESTLUND (China (Beijing))*

Globally, the current developed countries such as the US and Sweden, used to experience the decaying countryside when the countries underwent rapid urbanization process, in which villages lost quite many young laborers and local industries declined and depressed due to the shrinking local markets. Some villages even died out or merged into other big villages. Then, great endeavors were made to revitalize the decaying countryside to maintain their rural identity when the country's major population is urbanized and residing in cities. During the past decades, China has been undergoing rapid urbanization development which however, induced the aggravated rural hollowing problem. The once self-sufficient villages become hollowing and decaying in many places of rural China. What we have seen are peasants' outflows, arable land loss, infrastructure shortage, industry recession and rural social problems. As a result, the decaying countryside in China becomes unsuitable for living. Being an agrarian country of huge amount of peasants, the decaying countryside must regain vitalities to ensure agricultural production and land protection. How to revitalize the decaying countryside? What are the challenges? What China can learn from other countries? The paper aims to compare the Chinese and Swedish experiences in revitalizing the decaying countryside.



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# Analysis of Dynamical Mechanism of Rural Transformation Development in Typical Regions of China

*Hualou LONG (China)*

This paper chooses three typical regions, i.e., central and western regions with rich energy and mineral resources, central traditional agricultural regions, and eastern regions with high-speed economic development level, which are facing the issues of energy exploitation, food security and economic growth, respectively, in the process of rural development, to analyze the dynamical mechanism of rural transformation development. The major conclusions are concluded as follows: (1) the rural transformation development influenced by the interaction of internal factors and external dynamic mechanism usually shapes different socio-economic morphology and territorial spatial patterns and thereby presents different urban-rural relationships; (2) currently, the western region, central region and eastern region belong to unbalanced urban-rural development stage with big economic development gap between urban and rural areas, balanced urban-rural development with low economic development level and balanced urban-rural development with high economic development level, respectively; (3) for the future development of the western region, central region and eastern region, more attentions need to be paid to strengthening the endogenous ability of rural development, promoting industrial division cooperation and optimal allocation of urban-rural land resource and fostering new rural industry system, respectively.



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**Northern Night Lights: Using Satellite Imagery to Track the Growth and Decline of Arctic Cities from 1992-2012**

*Mia BENNETT (United States of America)*

Contrary to the so-called "Arctic boom," satellite imagery of the earth at night demonstrates that the regional geography of northern economic development is far from uniform. Furthermore, despite received notions of the Arctic as practically uninhabited, many parts of the Arctic have relatively high levels of urbanization due to the preeminence of centralized sites of natural resource extraction. With the DMSP-OLS V4 stable lights dataset, a series of 1-km resolution global mosaics depicting the earth at night, I examine spatial trends in the growth (and decline) of Arctic cities from 1992-2012. Focus is given to Russian and Nordic metropolises, as they constitute some of the largest urban areas in the Arctic while also elucidating recent drivers of urban change in the Arctic, including East Asian investment in places like Sakhalin. Preliminary change detection over this 20-year period reveals a decrease in lit pixels around several Russian cities like Norilsk, Nikel, Vorkuta, and Petropavlovsk-Kamchatsky, reflecting declines in population and economic output since the collapse of the Soviet Union. By contrast, in the Nordic countries, satellite imagery depicts an increase in the intensity and extent of lights in cities like Reykjavik and Hammerfest. Further work, however, is needed to more accurately assess changes in urban areas in the Norwegian, Swedish, and Finnish Arctic due to noise in the data. In future research, I plan to extend the use of this satellite imagery to develop pan-Arctic statistics on urban change and economic development.



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**Spatio-temporal pattern of China's rural development: A rurality index perspective**

*Yurui LI, Hualou LONG, Yansui LIU (China)*

China's rural areas are undergoing considerable spatio-temporal change. To some extent, this change increases the difficulty in our understanding the regional rural development and thus brings about challenges for the making of feasible regional rural development policies and strategic planning. This study establishes an index system to evaluate the degree of rurality in China at county level using national census data of 2000 and 2010, and examines the correlationship between rurality index and major socio-economic and geographical indicators. The results of evaluation and spatial analysis show that the rurality index can largely reflect the spatio-temporal patterns of China's rural development, and the Pearson correlation analysis confirmed that counties with high rurality have been marginalized in the aspects of both geographical location and economic development. As such, the patterns of rural development identified by rurality index analysis significantly improve our knowledge on the recent development of rural China. However, this index is less successful in revealing the agricultural production status quo alone. The authors argue that rurality index is an important tool for measuring rural development, and could provide us with valuable information for local planning and the innovation of rural development policies. Furthermore, integrating rurality studies and rural socio-economic analysis can contribute greatly to the making of integrated and regionalized rural development policies.



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# Water resources change in Eurasia in XXI century

## Water resources change in Eurasia in XXI century 1

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- Climate change and water resource scarcity in Rajasthan, India

  *R. B. SINGH (India)*

- Development of water quantity and water quality values of the transnational Zarafshon River during the 20th and 21th centuries

  *Christian OPP, Michael GROLL, Rashid KULMATOV, Inom NORMATOV (Germany)*

- Availability Of Water Resources In The Ganga River Basin Under Climatic And Socio-Economic Conditions

  *Mohan PATHAK (India)*

- Up-to-date renewable water resources in European Russia

  *Natalia FROLOVA, R.G. DZHAMALOV, N.L. FROLOVA, A.A. BUGROV, M.O. FATKHI, M.I. IGONINA, V.Y. GRIGORIEV, M.B. KIREEVA, G.N. KRICHEVETS, E.P. RETS, T.I. SAFRONOVA, A.A. TELEGINA, E.A. TELEGINA (Russian Federation)*

- Pesticide Residue Analysis of Ground Water Samples Taken from Water Troughs and Bore Wells Located at Jaipur Tehsil, Rajasthan, India

  *Alka KATARIA, B. C. JAT (India)*

## Water resources change in Eurasia in XXI century 2

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- The Hydrogeological Properties Of The Water Resources Near The Village Of Ilisu (Mardin/Turkey)

  *Ali Rıza* SÖGÜT, Ahmet GÜZEL (Turkey)

- Climate change impact on hydrological change in the Ta Chin River Basin, Thailand

  *Sathaporn MONPRAPUSSORN (Thailand)*

- Hydrological study of Ecological Regeneration through Watershed Programme in District Tonk (Rajasthan),India

  *Birdhi Chand JAT (India)*

- The Expected Changes in Minimum Flow on the Volga Basin Territory under Global Warming

  *Marina TRUBETSKOVA, M. BOLGOV, E. KOROBKINA, M. FILIMONOVA, I. FILIPPOVA (Russian Federation)*



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**Water resources change in Eurasia in XXI century 3**

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- Irtysh transboundary basin: competition and cooperation
  *Bella KRASNOYAROVA, Sergei GANZA (Russian Federation)*
- Impact Of Climate Change On Water Resources In Coastal Karnataka, India
  *Ashok KUMAR (India)*
- Changing rainfall patterns and their linkage to floods in Bhagirathi-Hooghly Basin (BHB), India: Implications for Water Resource Management
  *Narayan Chandra JANA (India)*
- Forecast estimation of hydrological regime changes of big reservoirs in European territory of Russia
  *Maria GRECHUSHNIKOVA, Mihail SAMOKHIN (Russian Federation)*
- Malarial spread in changing urban environment of Thane District of Maharashtra, India
  *Sachin DEORE (India)*

**Water resources change in Eurasia in XXI century 4**

**Chairperson(s):** *R.B.SINGH, Sergey CHALOV,Daniel KARTHE*

- Water resources of largest lakes in Eurasia, current state and near-term prospects
  *Anna IZMAILOVA (Russian Federation)*
- High Fluoride And Endemic Fluorosis : A Case Study Of Didwana Tehsil, Rajasthan
  *Amita CHOUDHARY, Vijay CHOUDHARY (India)*
- Long-term scenario design of river runoff changes in the large Russian river basins.
  *A.G. GEORGIADI, N.I. KORONKEVICH, I.P. MILYUKOVA, E.A. BARABANOVA (Russian Federation)*
- Using UAV generated data for the characterisation of riverine systems – case study in the headwaters of the Volga River
  *Christian HAAS, Philipp THUMSER, Jeffrey TUHTAN, V.V. KUZOVLEV, Y. N. ZHENIKOV, Martin SCHLETTERER (Germany)*

**Water resources change in Eurasia in XXI century 5**

**Chairperson(s):** *R.B.SINGH, Sergey CHALOV, Daniel KARTHE*

- Re-establishing river continuity: examples of WFD-measures along the Inn River (Tyrol,



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Austria)

*Martin SCHLETTERER, Martin OBERWALDER, Johann NEUNER, Gebhard SENN, Stefan THONHAUSER, Andreas HEEL, Robert REINDL, Bernhard HOFER (Austria)*

- Regional estimation of daily reference evapotranspiration from limited numbers of weather parameters and GIS technique

  *Sabziparvar AKBAR- ALI, S. SAGHAEE, M.J. NAZEMOSADA and H. NOZAR (Iran)*

- Classification of benthic biocenosis of the lowland river Tudovka (Tver Region, Russia) using community features

  *Martin SCHLETTERER, Vyacheslav V. KUZOVLEV, Yuri N. ZHENIKOV, Nataliya STROKINA, Jeffrey TUHTAN (Austria)*

- Land Use Land Cover Mapping, Change Detection Using Geo-Informatics And Pollution In Yamuna River, Delhi

  *Vishwa SHARMA (India)*

## POSTER EXHIBITION

- Modelling of a regime of Volga-Akhtuba floodplain flowage in the conditions of anthropogenous influence and climatic changes (Water Problem Institute of RAS, RF)

  *Ksenia SHATALOVA, M.V. BOLGOV (Russian Federation)*

- Decreased river runoff in the North Eurasian plains during the Holocene optimum as a possible scenario for the 21st century (Moscow State University)

  *Aleksey SIDORCHUK, O. BORISOVA, A. PANIN (Russian Federation)*

- Availability of water resources in a regional global change scenario in Mediterranean area (University of Zaragoza, Spain)

  *Roberto SERRANO-NOTIVOLI, Eduard PLA, Diana PASCUAL, Javier ZABALZA, Sergio VICENTE-SERRANO, Gabriel BORRÀS, Carmen BIEL, Inma FUNES, Robert SAVÉ (Spain)*

- Transformation of the water balance and water policy in the Crimean region

  *Lidiya SOTSKOVA (Russian Federation)*

- Water resources and food production in Asian countries in XXI century

  *Alexander DEMIN, M. TRUBETSKOVA (Russian Federation)*



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# Climate change and water resource scarcity in Rajasthan, India

*R. B. SINGH (India)*

Climate change is the major environmental challenge faced by the global community. The developing regions which are scarce on resources and the resources like water, which are primarily dependent on climate, are among the most vulnerable. Therefore, the objective of the present study is to conduct an analysis of climate change and water resource scarcity in Rajasthan to help in prioritizing the regions and components of development. Rajasthan is largest state of India and divided into 10 agro-climatic zones ranging from Hyper Arid to Sub-Humid. The population of Rajasthan is 68.6 million, out of which 75.11 per cent was rural population. About 65 per cent population of the state is dependent on agriculture and allied activities for their livelihood. Agriculture in Rajasthan is primarily rainfed covering country's 13.27 per cent of available land. The analysis of climate variability over the state has been done using the database from India Meteorological Department. The parameters used for analysis are average temperature, maximum temperature, minimum temperature, evapo-transpiration, rainfall and number of rainy days. The climatic data used in the study pertains to the period of 1950-2010. The vulnerability analysis of agriculture sector has been done to identify the areas which are at highest risk to impact of climate change. The results show that during 1950-2010 the temperature has depicted a great variability with an average rise of about 0.168 oC for winter season, 0.240 oC in summer season and 0.304 oC in autumn season. A decrease in rainfall has been observed over the state during 1950-2010. The climate variability has direct impact on the water resources of the region. The low to medium rainfall in most parts, high evapo-transpiration demands for water, high frequency of occurrence of droughts resulting from the departure of rainfall from mean values, and the high per capita arable land increases the demand for irrigation water. The region is characterized by heterogeneity in groundwater conditions. Most of the aquifers are saline, except some patches in the extreme west. Rajasthan stands first in terms of degree and extent of over-exploitation of groundwater resources in the country. This is being met through mining of groundwater resources. The free power in agriculture continued for many years, and the existing pump horse power based pricing of electricity encourage over-pumping and inefficient and often wasteful use of groundwater. The advent of Indira Gandhi Canal in the fragile desert ecosystems helps the region to cope with high variability in rainfall. Water security in the region can be attained through expansion of canal network.



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# Development of water quantity and water quality values of the transnational Zarafshon River during the 20th and 21th centuries

*Christian OPP, Michael GROLL, Rashid KULMATOV, Inom NORMATOV (Germany)*

Most of Central Asia's rivers as well as their tributaries are transnational water courses. Another wide spread feature of the river catchments in this region is the differentiation into an mountainous upper part of the catchment, where most of the run-off is generated, and a downstream lowland part of the catchment, where most of the water is used. This spatial separation of water availability and demand causes several problems. Some of them are of transnational character and require interstate agreements. But all of them result in typical upstream-downstream relations and ask for a catchment-based integrated water resource management approach. These problems will be analyzed within this presentation for the transboundary Zarafshon river catchment. The results are based on field measurements, existing data and an extensive literature analysis. Together they cover the meteorological, hydrological and hydrochemical characteristics of the upstream and downstream parts of the catchment. Ore mining, soil erosion and the planned hydropower utilization were identified as the main challenges for an integrated water resource management in the upstream sections, while the downstream sections are characterized by an increasing water deficit and a deteriorating water quality, caused by extensive irrigation farming as well as by industrial and municipal waste water. Both climate change and a strong socioeconomic growth will continue to influence this catchment in the 21st century. The current state of the water resources and possible future developments of water availability and demand will be discussed as a basis for the implementation of an IWRM plan.



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**Availability Of Water Resources In The Ganga River Basin Under Climatic And Socio-Economic Conditions**

*Mohan PATHAK (India)*

The Ganga river basin is one of the largest catchments in the world with 861400 sq. Km geographical area. Water availability in the basin is highly dependent on south west summer monsoon rain and snow melt from the Himalaya. Rivers originating from the Himalaya deliver large quantities of runoff for the major tributaries of the Ganga and hence make substantial contribution to the water resources. Monsoon provide about 80 per cent of the basin's annual precipitation in only four months from June to September. The annual volume of water discharge by the Ganga is the fifth highest in the world, with a mean discharge rate of 187 × 107 cube meter per second . About 450 million people live in the basin and use its water resources for their livelihood. Ground water has taken the dominant place in agriculture and accounts for over 60 per cent of irrigated area. The changes in climatic factors such as precipitation and temperature will affect the water supply as well as the availability in the basin. Under a changing climate, seasonal extremes and supply-demand imbalance are likely to increase in the basin. One approach to managing water resources in the basin is upstream storage of excess wet-season river flow for use during dry season. This requires conjunctive use management strategies. This article examines the potential for sustainable development of surface water and ground water resources within the constraints imposed by climate change and socio-economic conditions of the people in the Ganga river basin.



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## Up-to-date renewable water resources in European Russia

*Natalia FROLOVA, R.G. DZHAMALOV, N.L. FROLOVA, A.A. BUGROV, M.O. FATKHI, M.I. IGONINA, V.Y. GRIGORIEV, M.B. KIREEVA, G.N. KRICHEVETS, E.P. RETS, T.I. SAFRONOVA, A.A. TELEGINA, E.A. TELEGINA (Russian Federation)*

In recent decades, the validity of the concept assuming the stationary character of long-term variations of meteorological and hydrological characteristics raises doubts because of the increasing instability of climate processes. The current climate changes have already caused considerable changes in the water regime and formation conditions of water resources in a number of large regions. The new situation requires a revaluation of the renewable water resources (natural resources of groundwater and surface water) because of changes in climate characteristics, which affect the formation of water balance elements in river basins. Regional estimates along with the analysis of water resources distribution in European Russia show the space and time dynamics of the surface and subsurface components of river runoff, taking into account the current features of their formation under the effect of changing climate. The work was based on up-to-date scientific and methodological principles of statistical processing and examining the time distribution of the mean annual, dry-season, and minimal water resources and their space distribution over river basins and the constituent entities of the Russian Federation. The problems solved in the study are as follows: general regularities and features of water resources formation were established; the distributions of specific water availability characteristics for territories and population were evaluated; the absolute and specific amounts of water resources for river basins, federal districts, and RF constituent entities were calculated, as required for the rational use and protection of water resources. The study was supported by the Russian Science Foundation (grant No. 14-17-00155).



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# Pesticide Residue Analysis of Ground Water Samples Taken from Water Troughs and Bore Wells Located at Jaipur Tehsil, Rajasthan, India

*Alka KATARIA, B. C. JAT (India)*

Ground water samples were collected from bore wells and water troughs from different sampling points of three dahnis of Jaipur tehsil for two years i.e. 2013 and 2014 in winter and summer months for the analysis of pesticide residue and various other water parameters. Pesticide concentrations were determined by using GC-ECD. Most of the ground water samples in troughs were found to be contaminated. Pesticides- Methyl Paraxon, Phosphomidon, Chlorpyriphos, Profenophos- concentrations of the trough water samples in summer months ranged from 0.120-0.320 ppm, 0.0345-0.109 ppm, 0.127-0.231 ppm and 0.287-0.312 ppm, respectively. In winter months the concentrations were in the range of 0.339-0.634 ppm for Methyl Paraxon, 0.114-0.225 ppm for Phosphomidon, 0.328-0.426 ppm for Chlorpyriphos and 0.413-0.622 ppm for Profenophos.



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**The Hydrogeological Properties Of The Water Resources Near The Village Of Ilisu (Mardin/Turkey)**

*Ali Rıza* SÖGÜT, Ahmet GÜZEL (Turkey)

In the study area, there are Paleocene Germav formation, Eocene Midyat formation, Quaternary Gevareski basalt, the talus and alluvial. The Germav formation is composed of greenish-, bluish-gray, hard, thick-textured, calcareous shale interbanded with fine sand marl. The Midyat formation is made up by light-dark grey and black colored, generally intermediate-thick bedded limestone and dolomite, with benthic foraminifera and shell fragments. Chalky dolomites takes place at the upper part level of the unit. Autochthon Gevareski basalt form as lava flows in the field. The alluvium is situated along Tigris river bed and depression field. Gravel deposits at the river bed are substantial in determining water resources. There are a few water sources with very low flow in the field, except the Midyat Formation rocks. This suggests that the depth of underground water level in Midyat formation is not deeper than the rest of the formations in the field. The underground water level is 5-30 m higher than the Tigris River on the slopes of the Germav formation in the Ilisu region. Some karst resources exist in the dam lake area and on the downstream side of the dam. The flow rates of the resources of the Midyat limestone in Rezuk and Pireder creek are 500-800 ℓ/s and 500-600 l/s, respectively. Chemical analysis of samples taken from water sources suggests that water has co-genesis. Piper diagram of the samples also indicate that the samples are of soft water with high carbonate alkalinity. Besides, there are thermal springs in the Ilıca village with a stream flow of 4-5 ℓ/s and with 40-45 0C temperature.



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**Climate change impact on hydrological change in the Ta Chin River Basin, Thailand**

*Sathaporn MONPRAPUSSORN (Thailand)*

Climate change intensified the global and regional water cycle. Natural climate variability introduces the considerable effects on hydrological change that can alter its functions and response. In order to assess hydrological effect of regional climate change precisely, simulation of future climate variability requires downscaling to accurately predict water supply and demand analysis. The Ta Chin river basin, situated in Central Thailand, is one out of 25 fives key river basins in Thailand as many activities such as agriculture, tourism, domestic and industry has been supported by the abundance of natural resources in the basin. The goals of paper were to explore and quantify hydrological effects of climate change by considering change in precipitation, temperature and sea level rise in Ta Chin river basin. Regional climate downscaling will be used to quantify those parameters and its impact in 2050. Socioeconomic development was also divided into three scenarios; business as usual (BAU), rapid economic growth (REC) and green growth (GG) in order to assess water balance in the basin. According to downscaled results, it reveals the increase in rainfall intensity and extreme water-weather related events like flood and drought. Change in hydrological cycle might largely impede the provisioning of water supply to agricultural and aquaculture sectors regarding to BAU and REC, while leading to water vulnerability of basin. Hydrological effects of climate change in the basin leads to substantial and long term change in community resilience.



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**Hydrological study of Ecological Regeneration through Watershed Programme in District Tonk (Rajasthan),India**

*Birdhi Chand JAT (India)*

Watershed development programme is an integrated effort for increasing production through better utilization of primary resources without causing any adverse effect on the ecologicall balance. The watershed approach has conventionally aimed at treating degraded lands with the help of low cost and locally accessed technologies such as in situ soil and moisture conservation measures, afforesting etc. and through a participatory approach that seeks to secure close involvement of the user communities. The broad objective was the promotion of the overall economic development and improvement of the socio-economic conditions of the resource poor sections of people inhabiting the programme areas. Many projects designed within this approach were at different points of time, taken up by the government of India. The Drought Prone Areas Programme (DPAP) and the Desert Development Programme (DDP) were brought into the watershed mode in 1987. The Integrated wasteland development of the national wasteland development board also aimed at the development of wasteland on watershed basis.



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**The Expected Changes in Minimum Flow on the Volga Basin Territory under Global Warming**

*Marina TRUBETSKOVA, M. BOLGOV, E. KOROBKINA, M. FILIMONOVA, I. FILIPPOVA (Russian Federation)*

Climate warming causes a substantial increase of the river runoff during low-water periods on the European Russia leading to significant strengthening the natural regulation of flow. Long-term changes in the minimum flow cannot be analyzed in the framework of the stationarity hypothesis having been used for the hydrological foundation of water management until recently. The task of stochastic description of changes and accounting for the observed non-stationary flow process caused by global warming becomes very actual. On the example of the Volga River basin the methodic was elaborated for the estimation of probable changes in the minimal runoff characteristics for the winter and summer-autumn low-flow periods. The suggested methodic is based on the Bayesian methods and uses the forecasted values of the winter temperature rising. The characteristics of the minimal runoff of the rivers located in the Volga River basin were estimated for the 2011-2030 period. According to calculations, the minimum winter flow in all natural zones is expected to increase (by 1.4 - 1.6 times on average), the intensity of this growth is expected to increase from north to south. The most significant change in the minimum winter and summer-autumn runoff is expected to occur in the southern part of the Volga basin, in the forest-steppe and steppe zone.



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## Irtysh transboundary basin: competition and cooperation

*Bella KRASNOYAROVA, Sergei GANZA (Russian Federation)*

Transboundary water bodies – river Irtysh and its tributaries Ishim and Tobol, are of water economic importance for Russia, Kazakhstan and China having peculiar water resources and environmental problems. Growing water consumption in China in the Kara-Irtysh basin is a destabilizing factor for functioning the Irtysh water system that affects the operation of large hydraulic structures in Kazakhstan and leads to water resources shortage in the Russian part of the basin, nearby Omsk. The Irtysh basin is one of major sources of water supply for the population and economy of Eastern and Northern Kazakhstan. Water resources of the Ishim are mainly formed within the territory of Kazakhstan. Previously, up to 65 % of its runoff fell on Russia, the current structure of apportionment has been changed due to increased water needs of Astana. The Tobol is a doubly transboundary river because its flow is formed on the Russian territory, enters Kazakhstan and comes back to Russia again. This is the most loaded basin; some small Tobol's tributaries sustain constant water stress and pollution. In spite of a bilateral agreement between Russia-Kazakhstan and Kazakhstan – China, the processes of water use in the Irtysh basin are still a matter of discord. Each country pursues its own interests in water resources use. The policy of water management by transboundary waters should be considered at a regional and national level of the international relations development thus being an important part of the state's foreign policy.



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# Impact Of Climate Change On Water Resources In Coastal Karnataka, India

*Ashok KUMAR (India)*

Climate change is one of the biggest environmental threats to food production, water availability, and livelihoods. It is widely believed that developing countries such as India will be impacted more severely than developed countries. Global warming and Climate Change is projected to increase the number of extreme temperature and rainfall events, and hence climate variability is expected to show an upward trend. It is very important to understand the past trends and variability in rainfall, minimum and maximum temperature in Karnataka since the knowledge on the past could provide guidance for the future. The Arabian Sea and the Kanara coast belong to the "Indo-Australian Marine Bio-geographic Region" considered to be the richest in the world for biodiversity. The coastal backwaters, estuaries, river-mouths, are well known for their productivity. Some of them like the Aghanashini, Kali and Sharavati river backwaters, are even today so. The rivers from the Western Ghats carry great quantity of forest organic matter and deposit the same in the coastal waters, including the sea. The current climate variability in Karnataka has been analyzed using the IMD daily rainfall data for the period of 1971 – 2012. The Costal Karnataka districts have an average rainfall of >25 mm/day. Decrease in precipitation trend has been observed in Coastal Karnataka. Rainfall has decreased by 17.69, 1.87 and 22.38 mm/day/ 100 year in Mangalore, North Kanara and Udupi respectively. The decrease in rainfall has led to water scarcity for drinking purpose and for agriculture. The water quality in coastal areas is frequently interrupted by ground water infiltration of coastal water. The water stress conditions has also led to the drying up of natural vegetation.



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# Changing rainfall patterns and their linkage to floods in Bhagirathi-Hooghly Basin (BHB), India: Implications for Water Resource Management

*Narayan Chandra JANA (India)*

The study of hydroclimatic variables is critically important for a country whose food security and economy are dependent on the timely availability of water. Any change in this availability directly affects the socio-economic conditions of a country like India where rainfall is quite predictable as it depends on monsoons. The change in the trend or behaviour of rainfall patterns for long time (1901-2000) can contribute to apprehensive climatic change. Bhagirathi-Hooghly River basin (BHB), a part of western Ganga-Brahmaputra Delta is one of the recognized climatic vulnerable regions of India. Recent occurrences of the extreme floods in this basin underscore the importance of evaluating the trend and variability of rainfall in order to understand the potential impact of future change. The present study provides a synoptic view of recent changes in the patterns of rainfall and their linkages to extreme floods in BHB. The objectives of this study are (a) to obtain a better understanding of long-term and short-term trends and variations in rainfall; and (b) to ascertain whether the extreme floods were clustered in time and whether they coincided with multi-decade excess monsoon rainfall epochs at the basin level streamflow. To fulfill the above objectives, we use annual maximum flood series of different rivers situated in BHB and district-wise long-term (1901-2000) monthly rainfall data. The data are mostly obtained from India Meteorological Department (IMD), Central Water Commission (CWC), numerous research articles, published reports and a few unpublished reports. The methodology adopts various statistical approaches and simple techniques, such as the seasonality index (SI), Cramer's t-statistic, regression and Mann-Kendall (MK) test with Sen's slope estimator in order to evaluate the trends and patterns of the rainfall series and stream flows. The results of this study would help the reservoir managers and policy makers in planning and management of water resources of the BHB.
Key Words: Climatic variability, rainfall pattern, extreme floods, excess monsoon rainfall periods, water resources. *Corresponding author. Email: jana.narayan@gmail.com



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# Forecast estimation of hydrological regime changes of big reservoirs in European territory of Russia

*Maria GRECHUSHNIKOVA, Mihail SAMOKHIN (Russian Federation)*

As a result of experimental calculations for some polytypic reservoirs in the European territory of Russia their hydrological regime will probably change at implementation of the most adverse forecasts of drain reduction. The following changes are expected: increase of intra annual amplitude of water surface temperature, increase in duration of the period of open water, reduction of water inflow in reservoirs and reduction of their flowage, increase of summer stratification duration, deterioration of the oxygen regime in summer and improvement in winter. Change of the hydrological regime can entail ambiguous changes of biological processes. Reduction of level amplitude fluctuations is favorable for water plants growth reducing phosphoric load on the reservoir. However the general lowering of the level in the conditions of underfilling to normal gorizont can reduce this factor at the expense of increase in exchange of phosphorus with ground deposits at reduction of depth. At decrease in level of filling warming up of benthonic layers can cause earlier approach of a phase of blue-green algae cages emersion. At shift of terms of hydrological regime phases it is possible to expect more earlier approach of algae development phases. Results of modeling showed that the strong overheat of water bodies at climatic changes shouldn't be expected. The initial level and weather conditions during stratification forming are very important. Also upwellings and deep mixing during cold periods in summer are important for taking out of food supply to a surface from a benthonic layer, t.e. whether synoptic fluctuations of meteorological characteristics will increase. The work is supported by RFBR project 13-05-00137.



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**Malarial spread in changing urban environment of Thane District of Maharashtra, India**

*Sachin DEORE (India)*

Urban dynamics, environment and health are global challenges because the interaction of these three components on one hand provides the means of progress, prosperity, peace and wellness of the people but irrational and unplanned growth of urban areas, careless and ruthless behavior of human beings with environment to fulfil their greed on the other hand led to worsening conditions, which in turn harms the health (Sinha B.R.K.2013). Urbanization and unprecedented growth of suburbs has become a common phenomenon of metropolitan cities in India. Thane urban area, a part of Thane district in Maharashtra, is located on the western coast of India and a cousin district of Mumbai metropolitan city. An attempt has been made to study the retrospective scenario of ten years based on secondary data of malaria and dengue incidences. API (Annual Parasitic Index) of the major urban areas indicate increasing trend of occurrence of malaria. The study reveals that the continuous migration and pressure on administration has resulted into deteriorating health environment. Strict implementation of health care schemes, improvement in surveillance, collaborative planning can control the spread of malaria.



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**Water resources of largest lakes in Eurasia, current state and near-term prospects**

*Anna IZMAILOVA (Russian Federation)*

Eurasia – is the largest continent in the world, covering more than 1/3 of the land surface. 25 of the 36 largest saline and brackish lakes in the world (with a surface area of more 1,000 km2) and 28 of the 93 largest freshwater lakes are located here. They contain 81,130 km3 and 25,940 km3 of water, respectively. If by the volume of saline and brackish lake waters Eurasia belongs to the absolute leadership, by the volume of fresh water it yields the pas to Africa (containing vast reserves of water in the lakes of the African Reef), and North America. Along with the natural water bodies, there are 26 of the 58 largest reservoirs of the world (with the same area) with a total water volume of about 890 km3 in Eurasia. Eurasia is home to about ¾ of the population of the planet that determines the huge pressure on its water resources. The current ecological state of the largest lakes and reservoirs of Eurasia is considered in this report. Quantitative loss of lake`s fund, which occurred in the twentieth century, are given. The dynamic of changes in total volumes of water of different quality categories for 1950-2010 and measures taken in the different countries to improve the quality of lake water are analyzed. Water quality in the largest lakes compared with the water quality in reservoirs. Possible changes in lake fund in the near-future and the major deterrent factors of environmental improvement of lake ecosystems are considered.



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**High Fluoride And Endemic Fluorosis : A Case Study Of Didwana Tehsil, Rajasthan**

*Amita CHOUDHARY, Vijay CHOUDHARY (India)*

HIGH FLUORIDE AND ENDEMIC FLUOROSIS : A CASE STUDY OF DIDWANA TEHSIL, RAJASTHAN Amita Choudhary*, Dr. Vijay Choudhary** *Research Scholar, Department of Geography, University of Rajasthan, Jaipur. **Lecturer, Govt. Senior Secondary School, Chomu, Jaipur, Rajasthan, India. ABSTRACT High fluoride incidence in groundwater is injurious to human health. It causes a fatal disease known as "Fluorosis". It is an environmental disaster being experienced by millions of people in the world. India is also confronting the same problem. In Rajasthan, groundwater of Didwana Tehsil, Nagaur district are enriched with high concentration of fluoride. Didwana Tehsil is prone to both dental fluorosis and skeletal fluorosis. The fluoride concentration was less than permissible limit (1.5 mg/l) in 29.17% samples and 70.83% samples showed higher concentration of fluoride. Fluoride concentration in drinking water ranged from 0.55 mg/l to 10.20 mg/l in 24 samples. 44.85% of people were found to be affected with dental fluorosis. Adults are prone to dental fluorosis. 14.05% of people were found be to affected with skeletal fluorosis. No children were found to be affected with skeletal fluorosis, the prevalence of skeletal fluorosis was higher in males and increased with age and higher fluoride level. Statistically positive correlation were found between fluoride concentration and dental fluorosis in both children (r = +0.905)and adults (r = + 0.887). Statistically positive correlation were also found between F concentration and skeletal fluorosis (r = + 0.968). The ratio of males affected by fluorosis was slightly but significantly higher than the ratio of females. Major factors responsible for a higher incidence of fluorosis in villages having similar fluoride concentration are discussed. Keywords: fluoride, groundwater, fluorosis, Didwana Tehsil, dental fluorosis, skeletal fluorosis.



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**Long-term scenario design of river runoff changes in the large Russian river basins.**

*A.G. GEORGIADI, N.I. KORONKEVICH, I.P. MILYUKOVA, E.A. BARABANOVA (Russian Federation)*

The approach for the long-term scenario design of river runoff changes in the large Russian river basins in the first three decades of the 21st century includes two methods: a method of scenario estimations of runoff changes under probable climatic warming, which is based on generalization of the calculations made on the ensemble of global climatic models, and a method of alternative scenario estimations for water management complex transformation. The methodology described is based on the monthly water balance model of the RAS Institute of Geography. The range of probable climatic changes that is estimated by calculating deviations of climatic elements from their recent values is used as a climatic scenario. The calculations are made for the two scenarios with the most and least intensive rise of globally averaged air temperature. Simulation results obtained by using ensemble of global climate models are employed. These were included in the IPCC program of CMIP3 (Meehl et al., 2007) *и* CMIP5 (http://cmip-pcmdi.llnl.gov/cmip5/) experiments. The method for the long-term scenario projection of transformation of water management complex characteristics takes into account the available forecasts of population growth, indices of the development of the main economic sectors, and specific water consumption. Again, radical methods to prevent water resources deterioration are also taken into account. The results of the development of integrated scenarios are presented, with the Volga, the Don and the Lena River basins taken as an example.



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# Using UAV generated data for the characterisation of riverine systems – case study in the headwaters of the Volga River

*Christian HAAS, Philipp THUMSER, Jeffrey TUHTAN, V.V. KUZOVLEV, Y. N. ZHENIKOV, Martin SCHLETTERER (Germany)*

Civil applications of unmanned aerial vehicles (UAVs) have grown rapidly over the past years. Current applications are archaeology, geography, mining, as well as civil engineering and ecology. UAVs can be leveraged to rapidly create high resolution (up to 1 cm/px) maps of river landscapes and thus have the advantage of being both lean and agile. A lightweight multi-camera system specially designed for UAVs was tested, generating total coverage spectral imagery. Another advantage is the possibility of mapping of macrophyte stands. High resolution maps of the Normalized Differenced Vegetation Index (NDVI) were generated using near infrared (NIR) imagery gathered by the multi camera system. This hybrid approach allows for detailed study of the interactions between hydromorphological conditions and auquatic as well terrestrial vegetation. Digital surface models (DSM) were produced with the structure from motion (SfM) technique, using data from high resolution areal photography as well as terrestrial photography. On this basis hydraulic and morphological conditions were assessed and compared to field records. The proposed methods enable the creation of a detailed view on a monitoring site. The morphodynamic characterisation is linked with the biological dataset (zoobenthos and macrophytes) of the monitoring project REFCOND_VOLGA. The results underline the importance of diverse habitat patches in order to provide suitable conditions for different taxa, i.e. highly structured habitats increase biodiversity. We propose that environmental intelligence gathering using remote sensing with spectral imagery and ground-based observations can be applied increase the scope of scientific surveillance, and can lead to new opportunities to detect and quantify complex ecological interactions across a wide spectrum of scales.



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# Re-establishing river continuity: examples of WFD-measures along the Inn River (Tyrol, Austria)

*Martin SCHLETTERER, Martin OBERWALDER, Johann NEUNER, Gebhard SENN, Stefan THONHAUSER, Andreas HEEL, Robert REINDL, Bernhard HOFER (Austria)*

The European Water Framework Directive (WFD) became a major tool in European water policy. All the member states had to develop River Basin Management Plans (RBMPs). Austria's first National Water Resource Management Plan was published in 2009 and describes measures to be set. Depending on the catchment size, ecological targets were defined on water body level, to be reached by 2015, 2021 or 2027. A priority goal is the re-establishment of river continuity. Therefore the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management published a "Guideline for the construction of fish passes" in 2012. Founded in 1924 TIWAG started its business with the construction of the Achenseekraftwerk, at the time one of Europe's largest storage facilities. Since then TIWAG expanded its expertise on engineering, constructing and operating a number of different kinds hydro power plants in Tyrol. In the first river basin management cycle at three hydropower plants, located in the "priority river network" (HPP Langkampfen, HPP Kirchbichl and HPP Imst - the latter with the weir Runserau and the water intake at Wenns), measures had to be developed to overcome discontinuity. During planning phase it was tried to apply "standard solutions" according to the Austrian guideline. This was possible for three sites, where we planned vertical-slot fishways in combination with natural bypass channels. At the weir Runserau it was not possible to use a "standard solution". Therefore alternatives were evaluated and it was decided to construct a fish-lift to enable upstream migration. As this is the first fish lift in Austria a review on existing fish lifts was the basis for planning. We provide an overview on measures to re-establish river continuity that were recently planned or already established at the Inn River, a major tributary to the upper Danube River. Planning principles as well as details from the construction phase and monitoring concepts as well as first results are presented.



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# Regional estimation of daily reference evapotranspiration from limited numbers of weather parameters and GIS technique

*Sabziparvar AKBAR- ALI, S. SAGHAEE, M.J. NAZEMOSADA and H. NOZAR (Iran)*

Crop reference evapotranspiration (ET0) is an important component of hydrological cycle for determination of crop water requirement in agriculture and water resources management. In the present study, we generate regional maps of monthly reference evapotranspiration (ET0) in Grand Karkheh Basin, by using the minimum numbers of meteorological parameters from 24 synoptic stations in Iran. To determine the monthly ET0, we used FAO 56 method (Ref-ET) and regression analysis. The FAO 56 is used as an standard method for validation of ET0 from regression analysis. The highest correlation coefficients between ET0 and independent variables were found for the maximum temperature (Tmax), minimum temperature (Tmin), wind speed at 2 meters (U2) and relative humidity (RH), respectively. Regression equations were then derived based on the four aforesaid weather parameters. The best fitted interpolation method for each parameter was selected and the monthly regional maps of ET0 were generated for Grand Karkheh Basin. Using the coefficient of determination (R2), the mean absolute error (MAE), model efficiency (EF) and the relative error (RE), the accuracy of ET0 from regression method were evaluated against FAO 56 method. Results indicate that the regional ET0 maps which generated by the minimum numbers of weather parameters (indirect method) are reliable compare to the direct method (FAO 56 method).



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## Classification of benthic biocenosis of the lowland river Tudovka (Tver Region, Russia) using community features

*Martin SCHLETTERER, Vyacheslav V. KUZOVLEV, Yuri N. ZHENIKOV, Nataliya STROKINA, Jeffrey TUHTAN (Austria)*

Within the joint Russian-Austrian monitoring programme "Upper Volga Survey (2006 – 20XX)", monitoring sites were established in the headwaters of the Volga (Tver Region). River Tudovka, a right tributary to the Volga River, was included within this monitoring programme as its catchment is partly protected and has only few anthropogenic activities. The monitoring activities include physico-chemical and hydraulic parameters as well as biota with a focus is on benthic organisms (diatoms and macrozoobenthos). In this work, the longitudinal patterns in community structure are classified in the lowland river Tudovka using a novel feature-based approach taken from signal processing theory. The method first clusters field sampling data into longitudinal classes (upper, middle, lower course). Community features based on the relative frequency of individual species occurring per class are then generated. We apply both generative and discriminative classification methods. The application of generative methods provide data models which predict the probability of a new sample to belong to an existing class. In contrast, discriminative approaches search for differences between classes and allocates new data accordingly. Leveraging both methods allows for the creation of stable classifications. On this basis we show how the community features can be used to predict the longitudinal class. The community features approach also allows for a robust cross-comparison of investigation reaches over time. In cases where suitable long-term data set are available, predictive models using this approach can also be developed.



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# Land Use Land Cover Mapping, Change Detection Using Geo-Informatics And Pollution In Yamuna River, Delhi

*Vishwa SHARMA (India)*

The water quality of Yamuna at the point of its entry into Delhi fits to water quality standards in terms of Dissolved Oxygen (DO) and Bio-chemical Oxygen Demand (BOD). The BOD level in the Yamuna River has been in the range of 12 to 51 mg/l. The range of Chemical Oxygen Demand in Delhi varied from 50-155 mg/l. However, during its exit, the water quality becomes unfit for any purpose. Research paper analyse the present status of the river Yamuna. Despite ongoing research efforts on land-cover and land-use patterns, there remains a need for development of basic land-cover datasets providing quantitative, spatial land cover information. With the rapidly growing population in Delhi, pollution levels are at an all-time high and continue to become increasingly dangerous to city residents. Delhi is subject to pollution in all forms and has been categorized among the top ten most polluted cities in the world. The pollution of the river Yamuna has a variety of impacts on Delhi's environment. This paper analyzed land use/cover (LULC) of the past, present and futuristic modeling along river Yamuna, evaluated Land use/cover Change (LULCC) on the basis of socio-economic parameters. 1. To assess and analyse land use/cover (LULC) of the past, present and futuristic modellingalong river Yamuna. 2. To evaluate Land use/cover Change (LULCC) on the basis of socio-economic parameters 3. To quantify and analyse the impact of LULCC on the basis of land, water and air along the river. 4. To establish Sustainable Socio-Economic Framework (SSEF) for better LULC practices in accord with Delhi Vision 2021. The LULC data collection, classification and analysis has been done for over a decade (2001-2012) on the basis of LISS III, Landsat TM/ETM, STRM-DEM, SOI toposheet, from various government agencies and organizations. The physical data has been collected from organizations like: Survey of India Publications, Topographical Map 1:50,000, National Remote Sensing Agency (NRSA), Hyderabad, Central Pollution Control Board (CPCB), New Delhi and socio-economic data from Census of India Population Totals for Delhi, 1991 and 2001; District Statistical Handbooks etc. Remote sensing data and techniques and geographic information systems (GIS) provide efficient methods for analysis of land use issues and tools for land use planning and modelling. Besides, books, thesis, journals, articles, newspapers, internet websites has been consulted. After completing the analysis to show the maps cartographically correct, various cartographic techniques in ERDAS 9.1, ArcGIS 10 and ArcView 3.2a has been used. Various figures, charts and diagrams have been prepared to represent data in lucid way.



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**Modelling of a regime of Volga-Akhtuba floodplain flowage in the conditions of anthropogenous influence and climatic changes**
**(Water Problem Institute of RAS, RF)**

*Ksenia SHATALOVA, M.V. BOLGOV (Russian Federation)*

The distinctive feature of Volga-Akhtuba floodplain watering is its full dependence on hydrological regime of the Volga-Kama cascade and distribution of water between Volga and Akhtuba. Appreciable climatic changes of flow formation in the Volga basin caused low flow increase and the spring high flow reduction. Besides, in the Lower Volga basin the work of Volga-Kama cascade led to essential decrease in interannual variability of the major parameters - pique levels and discharges, as well as to reduction of duration of a rise phase, which caused sharp increase in intensity of a water level rising. The primary goal of the research is to estimate the transformation of a dumped hydrographer within the system of the Lower Volga river beds by means of one-dimensional hydrodynamical model. For use of such model, the additional network of imitating channels and capacities is created within its structure. This would compensate the influence of the river streams output on the floodplain and changes of water balance of intermediate sections. The structure of model represents consecutive set of all the river beds' parts of the Volga from the Volgograd reservoir downstream up to the Caspian sea. With its help, modern conditions of the Volga-Akhtuba floodplain in years with various water resources were investigated. According to the results of calculations, the suggested way of modelling of a hydrological regime of reservoirs and water-currents proved to be rather effective.



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**Decreased river runoff in the North Eurasian plains during the Holocene optimum as a possible scenario for the 21st century (Moscow State University)**

*Aleksey SIDORCHUK, O. BORISOVA, A. PANIN (Russian Federation)*

The remnants of the ancient rivers smaller than the modern ones are widespread in the floodplains of lowland rivers in Northern Eurasia. The largest number of floodplain segments with small oxbows is found in the coniferous forests in the north-eastern European Russia. The available radiocarbon dates show that such river channels were active during the Atlantic period of the Holocene. The hydro-morphometric methods were applied to calculate the mean annual discharges of these rivers. The lowest discharges were in the basins of the Vyatka and middle Irtysh rivers, about 40–50% of the modern values. In the other basins discharges were higher, but still less than the recent ones. During the Holocene optimum, water runoff from the northern mega-slope of the East European Plain was about 180 km3 yr–1, which is 30% less than the present runoff from the same drainage area. The annual runoff in the Volga River basin was ~134 km3 yr–1, which is about 50% of the present value. The runoff in the Don and Dnieper basins during the Holocene optimum was 40% less than the present one and that in the Ob and Irtysh basin – 30% less than the present one. If we accept the hypothesis that the Holocene optimum represents a climatic analogue of the global anthropogenic warming of the 21st century, the obtained estimates can be used as the scenario of future water resources in Northern Eurasia.



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# Availability of water resources in a regional global change scenario in Mediterranean area (University of Zaragoza, Spain)

*Roberto SERRANO-NOTIVOLI, Eduard PLA, Diana PASCUAL, Javier ZABALZA, Sergio VICENTE-SERRANO, Gabriel BORRÀS, Carmen BIEL, Inma FUNES, Robert SAVÉ (Spain)*

The Mediterranean basin is one of the most vulnerable areas under a global change scenario. Besides, 60% of the water-poor but very socioeconomically active countries in the world are located in this area. So, water demand is expected to increase in a context of a drier and warmer future climate, consequently, a general decrease of water availability is expected. This communication shows a brief part of an innovative methodology for applying adaptation strategies to address these impacts in framework of LIFE+ MEDACC (Demonstration and validation of innovative methodology for regional climate change adaptation in Mediterranean area) project. Three watersheds in northeast Spain (Muga, Ter and Segre) have been selected to test adaptation measures in water use in agriculture,forest management and urban requirements. The work developed to asses water resources has been divided in four steps: 1) Historical analysis of climate and hydrological data; 2) Modeling flow in last 10 years by two different eco-hydrological models (SWAT and RHESSys), which are integrating climate information, land use, soils characterization, relief, reservoirs management and water consumptions; 3) Evaluate differences between the models to obtain similar responses to observed flow in control period; and 4) Extend hydrological modeling to the future by changing climate data, land use and water consumptions by future projections. First analysis show that minimum temperatures have been increased and there are no clear trends in precipitation and flows have been meaningful reduced in the three watersheds, which only partially can be attributable to high evaporative demand. All of these preliminary results are agree with climate change projections for this area, because of that, is expected that final results will show the climate and land use change impacts and vulnerabilities of selected watersheds.



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**Transformation of the water balance and water policy in the Crimean region**

*Lidiya SOTSKOVA (Russian Federation)*

The Crimean Peninsula is a region with great landscape and biological diversity and significant recreational resources. At present, there was a dangerous transformation of the water balance. The first is associated with inter-basin transfer of waters of the Dnieper river in the North-Crimean canal, which began in 1972. Within 30 years, the import of water to 3.0 - 3.5 km3. Water was served over the network longer than 10 700 km of irrigated land area of about 400 hectares. Part of the Dnieper water (139 million $m^3$) was accumulated in 9 liquid reservoirs for water supply of the population. The functioning of the canal led to spatial and time redistribution of water resources, and phenomenal in the region, increase of the income and expenses parts of the water balance. The abundance transit waters, their spatial displacement, flooding of previously dry areas provoked metamorphosis of surface and underground component watersheds of the Crimea. 56 The water balance change resulted in a rise in groundwater levels and, as a consequence, the manifestation of the processes of water logging and secondary salinization. Underestimation of landscape and climatic features on the background of irrigation provoked the emergence of processes of transformation of all components of nature, damage and loss of individual features geosystems dry areas, loss of soil fertility. The development of water-intensive industries, outdated technology of irrigation, extremely high rates of water consumption on the one hand. The abundance transit waters, their spatial displacement, flooding of previously dry areas provoked metamorphosis of surface and underground component watersheds of the Crimea. The cessation of imports of water from the North-Crimean canal resulted in very unfavourable situation in the water sector of the region. This scenario water of Crimea include water transfer from the river Kuban, desalination of sea water, the construction of new reservoirs on local runoff, extremely expensive and poorly ecologically justified. Modern Water policy should be based on the identification and substantiation of the optimum for each natural-economic area of the Crimea patterns of water balance on the basis of the environmental (minimum environmental flow, maximum use of high quality water), social criteria (maintain or increase employment, economic growth, sustainable consumption). Found ways to save water, optimizing the structure of landscapes and forms of economic activity, which rationalizes the use of local water resources. Developed ways to save water, optimizing the structure of landscapes and forms of economic activity, which rationalizes the use of local water resources. The possibilities of human transformation of the components of the natural water balance in the framework of the optimization options - basis of ecologically balanced water policy.



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**Water resources and food production in Asian countries in XXI century**

*Alexander DEMIN, M. TRUBETSKOVA (Russian Federation)*

The amount of water necessary for a person for drinking and domestic purposes is insignificant in relation to its volumes needed for food production. A person needs 2-4 liters of water a day for drinking, and 30-300 liters for domestic use. To product daily necessities of food, people need 3,000 liters of water a day. In 2000, 65% of global freshwater consumption was the share of agriculture, while in the structure of irrevocable water consumption agriculture's share exceeded 84%. The main consumers of water among developing countries are India, China, and Pakistan. In most Asian countries, the share of the agricultural sector accounts for 75-90% (in some countries - 90-98%) of water volume used annually, and only 10-25% of it is spent on industry and utilities. Water consumption growth is complicated by the increasing number of droughts, a sharp decline in groundwater levels, deterioration of water quality in water bodies Measures aimed on improving water supply in agriculture: improving the productivity of water resources, wastewater reuse, saline water usage, importing 'virtual' water and others - are widely applied. Water management improvement plays a key role in increasing agricultural productivity of water resources. To feed the growing and more urbanized population having greater prosperity, world food production should grow by 70 percent until 2050. World experience proves melioration to be the main link stabilizing agricultural production. Withdrawal of water resources for irrigation in Asia will grow, but insignificantly. Increase in water deficit can stimulate tension between the countries of Asia.



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# Canada/Quebec: 100 mirrors

**Chairperson(s):** *Etienne BERTHOLD, Anastasia LOMAKINA*

- Russia, Canada, Quebec : Comparability and Determinism
  *Kim PAWLIW, Henri DORION, Etienne BERTHOLD (Canada)*
- Canada and Russia: Transport vs. Distances
  *Anastasia LOMAKINA (Russian Federation)*
- «Russia and Quebec/Canada : Heritages and tourism in comparative perspectives»
  *Etienne BERTHOLD; Laurent BOURDEAU; Guy MERCIER (Canada)*
- Rôle du facteur de la «nordicité» dans la formation de la culture au Québec et en Russie
  *Ekaterina ISAEVA (Russian Federation)*



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## Russia, Canada, Quebec: Comparability and Determinism

Kim PAWLIW, Henri DORION, Etienne BERTHOLD (Canada)

The current presentation highlights the preparation of the book Quebec, Canada, Russia : A Hundred Mirrors, which aims to present Russian realities to a Quebec and Canadian audience, and Quebec and Canadian realities to a Russian audience. The book is intended for a diverse audience: students and teachers in Russian Studies and Quebec / Canada Studies, media and even the general public. The text is bilingual, French and Russian. The book can also be used as a language learning tool. By taking advantage of the outcomes of the book, our presentation explores and assesses the methodological advantages and limitations of the comparative approach in the description and the geographical interpretation. It also aims to measure the relevance of multiscale comparisons, as the book has compared data on three geographic areas of dimensions, socioeconomic characteristics and status very different (Quebec, Canada, Russia). These three areas, however, share several similar elements: territorial dimensions (the two largest countries in the world and the largest Canadian provinces), presence of vast northern areas, rich natural resources, ethno-linguistic variety of the peoples, and particularly precarious status of some indigenous peoples. We conclude by warning against a deterministic approach, a danger for any comparative study.



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## Canada and Russia: Transport vs. Distances

Anastasia LOMAKINA (Russian Federation)

Common problem of such gigantic countries like Russia and Canada is the one of overcoming and friction space. Russian and Canadian ecumens present the most developed and densely populated as well as accessible territories. But within the limits of these areas differences in transport accessibility and density of infrastructure provision are observed. Even more noticeable differentiation of space is in the direction of north-south, which increases by the showing up of the Northern Territories. Differences of transport and geographical location of various regions of Canada and Russia determine the difference in the realization of their socio-economic potential. Thus regions with access to the sea shipping routes (Atlantic provinces, British Columbia, Russian Far East and North-West), enjoy the cheapest transport costs for access to the world market, while landlocked areas (Siberia, Prairies provinces) often have a negative effect of their inner geographic location. These are the range of North regions that share the most disadvantages location. Their logistic schemes are composed of several (4-5) modes of transport including season routes (Nunavut, Northwest Territories, North of Siberia). The presentation deals with different expressions of transport distance (geographical units, cost and time), as well as a problem of friction space caused by differences in transport-geographic and transport-economic location of divers regions of Russia and Canada. The different approaches resorted by Canada and Russia to solve the problem of overcoming space and compensating disadvantagous transport location of several regions are observed.



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«Russia and Quebec/Canada**: Heritages and tourism in comparative perspectives**»

Etienne BERTHOLD; Laurent BOURDEAU; Guy MERCIER (Canada)

Russia and Canada share much in common in terms of cultures. This presentation explores a few russian and canadian comtemporary heritage conservation policies in a comparative perspective. Over the last two decades in the field of heritage studies, research has emphasised the processes of heritage making, or "patrimonialization." Policies are an essential part of heritage conservation. They give an impulse to conservation and help their concrete implementation in public action and governance. As with many cultural policies, heritage policies do not follow a static list of objectives. They reflect historic contexts in which they have been created. Hence, they can nurture patrimonialization in many ways: by conveying the political ideologies of a group seeking domination over another by supporting the commodification process of heritage to different extents or by feeding knowledge constructs. For the purpose of this presentation, we will focus on urban heritage conservation policies that take place in the UNESCO World Heritage sites of St. Petersburg and Quebec City. These two cities both comprise historic districts widely frequented by tourists. First, we will examine some economical features of heritage conservation policies. In this field, we will focus on tourism and real estate values and their impacts on heritage conservation policies. Second, we will put the emphasis on some political issues and social debates underlying heritage conservation policies. Our purpose will be to explore how political ideologies are embodied in heritage conservation policies. In this perspective, we will explore two controversies that marked the social landscapes of Quebec City and St. Petersburg between 2008 and 2010. In Quebec City, the demolition of the Patronage St Vincent de Paul, a convent property situated in the protection area of the World Heritage site, and in St. Petersburg, the project (not completed) of a huge building by the national GazProm that was intended to take place in the heart of the historic district.



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# Rôle du facteur de la «nordicité» dans la formation de la culture au Québec et en Russie

Ekaterina ISAEVA (Russian Federation)

"La Russie et le Canada (Québec) sont deux pays situés géographiquement au Nord ce qui définit entre autres le caractère de la culture. Le climat rigoureux a déterminé la culture matérielle et non-matérielle des deux régions premièrement dans le choix et la construction de l'habitation (cf. maison rurale québécoise /isba) en bois - matériel ayant une capacité très haute de garder le chaleur. Cette précieuse qualité du bois devient déterminante également dans la construction des banya en Russie et des sauna au Québec. L'art populaire, à son tour, donne préférence au bois en création non seulement de meubles mais également de vaisselle et d'objets décoratifs où la sculpture du bois entre en concurrence avec la broderie - un artisanat ayant de multiples motifs nordiques tant en Russie qu'au Québec. Les thèmes de la « nordicitété », du climat rigoureux, de l'hiver long et froid sont récurrents pour le folklore québécois et russe (le costume traditionnel présente des similitudes tant dans l'assortiment des vêtements que dans ses accessoires). Le folklore narratif russe et québécois, en particulirer dans son genre du conte raconté souvent dans la famille autour du feu pendant de longues soirées d'hiver, privilégie le sujet du froid et de l'hiver, des esprits de neige qui mettent des obstacles sur le chemin des voyageurs. Died Moroz et Père Noêl qui apportent aux enfants des cadeaux sont des personnages nordiques qui sont généralement présents pendant les fêtes d'hiver dont la fin est célébrée pendant la Maslennitsa en Russie ou le Caranaval au Québec et où les images traditionnelles de l'hiver et du froid cohabitent avec des présentations plus modernes de la fête contenant des sports d'hiver. Donc, l'objectif de ma présentation est l'analyse des similitudes et des divergences des fragments de la culture russe et québécoises formés sous l'influence du facteur de la «nordicitée».



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# Geoheritages, A Recorder of the Global Change along the Silk Road for Future Sustainable Development

**Chairperson(s):** *Meng WANG*

- Geoheritage for Sustainable Development of Silk Road
  *Meng WANG, Alireza AMRIKAZEMI, Eduardo DE MULDER (Belgium)*
- Reconstructing lives from paleontological fossils: Project Darwin - nature science art project
  *Chuang ZHAO (China)*
- The Analysis on the Outstanding Universal Value of Tianshan Mountains as World Natural Heritage
  *Dongying WEI (China)*



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**Geoheritage for Sustainable Development of Silk Road**

Meng WANG, Alireza AMRIKAZEMI, Eduardo DE MULDER (Belgium)

Silk Road, a series of routes that extend across the Eurasian continent and connect a vast area of land including Russia, Mongolia, Turkey, Iran and the Balkan Peninsula, which is a significant traffic hub between the Asian and Europe continents. In the same time it is covers areas that are rich in natural resources such as water, hydrocarbons, and other minerals as well as the numerous of natural heritages and geological wonders. It is known that the developing of the economy is strongly depending on the using of mining, oil and gas. It may take the big challenge for the future development of the country. As the earth science, we do not only work on the resources, but also a lot of other things could serve for the society such as Risk Reduction, Climate change adaptation and Geohritage. There are 31 Global Geoparks in China, 62 in Europe region among 111 geoparks in 32 members states all over the world, but none of them in Middle east region. It is also the region with large potential on Nature Heritage.The geohritage will take a big capacity for the tourism, popularization of science, education and so on. YES Network will set up a new initiative as "Geo-Silk Road Initiative, Geo-Silk" to promote the new generation and geological innovation for future developing the Silk Road Nations.



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**Reconstructing lives from paleontological fossils: Project Darwin - nature science art project**

Chuang ZHAO (China)

As increasingly amount of paleontological fossils being discovered globally these year, scientific researches based on paleontological lives have grew stronger. Based on the latest research result, there has been pressing concern of scientific restoration of paleontological life images from globally discovered fossils. We firmly believe that to systematically reconstruct paleontological images of all fully researched and named fossils at large scale would contribute to the continuation of earth scientists' relevant researches, furthermore the project would enhance the public understanding to the influences of earth science research results. "Project Darwin - nature science art project" is a large-scale nature science art creation project for the purpose of restoring the extinct biological systems on the planet. The five modules of the Project Darwin include: Restoring biological appearances of prehistoric animals based on paleontological fossils, Restoring skeleton structures of prehistoric animals based on paleontological fossils, Creating 3D models of prehistoric animals based on paleontological fossils, Translating and compelling key knowledge of paleontology and Scientific description of representative paleontological fossils and corresponding species. The United Nation has implemented the strategic plan for Biodiversity in order to promote the overall vision of living in harmony with nature and the main goal is to prevent from further loss of biodiversity of the planet while maintaining the conservation of sustainable use of biodiversity contents. However vast numbers of already extinct species are lack of general awareness by modern mankind society unless needed for scientific research or educational purposes. We understand that, based on the scientific research result, a large-scale nature science art re-creation project for the purpose of restoring the extinct biological systems - especially for those which has extinct before human-beings existence - on the planet is vitally urgent and important. The project helps mankind to consciously realize the history of the Earth and additionally to agree on the reality of the cultural of biodiversity.



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**The Analysis on the Outstanding Universal Value of Tianshan Mountains as World Natural Heritage**

Dongying WEI (China)

The Tianshan Mountains lie in the hinterland of the largest continent named Eurasia in the world. Together with the Altay Mountains in the north, the Kunlun Mountains in the south and the Pamir in the west, they make up the mountainous backbone of Central Asia. The Tianshan mountain chain is one of the seven largest ones in the world. It is the largest mountain chain in the world's temperate arid region, and also is the largest isolated east-west streching mountain range globally. The Tianshan mountain range extends from the eastern Xingxingxia Gobi in Hami, Xinjiang to the western Kyzylkum Desert in Uzbekistan, encompassing the four countries of China, Kazakhstan, Uzbekistan and Kyrgyzstan. It is aligned almost trans-meridionally, with a total length of 2,500km. The average width is 250-350km meridionally, with the maximum width being 800km. It is surrounded by six deserts in three directions, including the world's largest flowing desert Taklimakan Desert. The Tianshan mountain range is composed of a series of mountains and inter-mountain basins. Xinjiang Tianshan has a diversity of natural beauty which makes it the most outstanding representative of a major montane landscape in an arid desert zone. The most prominent landscape features include snow peaks, glaciers, rivers, marshes, alpine lakes, meadows, forest and grassland, wetlands, red canyons and Gobi (stony) desert.



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# Natural resource management in drylands

## Natural resource management in drylands: problems of climate change adaptation and achieving land degradation neutrality 1

**Chairperson(s):** *German KUST, Tatiana KOUDERINA*

- Land Degradation Neutrality: a tool for Sustainable land management and climate change adaptation

  *German KUST, Olga ANDREEVA (Russian Federation)*

- Climate change and desertification of arid lands of European Russia

  *Alexander ZOLOTOKRYLIN, Tatiana TITKOVA, Elena CHERENKOVA, Vera VINOGRADOVA (Russian Federation)*

- The LaVaCCA project: Assessing land value changes and developing a discussion support tool for improved land use planning in the irrigated lowlands of Central Asia

  *Fabian LÖW, Elisabeth FLIEMANN, Christopher CONRAD, Victor DUKHOVNY, Nadija MURATOVA, Mirzakhayot IBRAKHIMOV, John LAMERS (Germany)*

## Special session: Natural resource management in drylands: problems of climate change adaptation and achieving land degradation neutrality 2

**Chairperson(s):** *German KUST, Tatiana KOUDERINA*

- The new drought products: translating drought monitoring information to risk assessment and management in the dry lands

  *V. CAZAC, Mihail DARADUR (Moldova)*

- Geochemical spreading of atmospheric aerosol in the landscapes of European Russia

  *Tatiana KUDERINA (Russian Federation)*

- A Model for Utilization of nuclear power and unused fresh water resources to rejuvenate the fading /vanishing life of Karnataka, INDIA

  *Venugopal VR (India)*



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# Land Degradation Neutrality: a tool for Sustainable land management and climate change adaptation

German KUST, Olga ANDREEVA (Russian Federation)

Drylands are among the most vulnerable ecosystems in the world. The majority of modern deserts are drylands degraded in the past. Key messages: • LDN is a new paradigm reflecting the cross-linked aspirations and demands of land-related SDG • LDN is politically sounding and attractive, it has a good background to be economically evaluated • LDN is a part of “Land-based approach” and might be considered as an operational platform for overlapping issues of 3 Rio conventions • LDN state can serve as a SLM target and overall criteria at different levels (local, subnational, national) • Spatial and temporal changes in land cover are measurable by indicators of land quality balance • LDN is not equally measured and is a site-specific (national-specific) matter, although global indicators of land quality can be considered as common platform for coordination • LDN concept needs advanced scientific development In practical terms the LDN concept is clear enough: SLM actions should not allow reducing the existing balance between “not yet degraded” and “already degraded” lands with persistent desire for the restoration of the last. Thus, the LDN can be considered as a practical tool to balance processes of land degradation and restoration/rehabilitation/ recovering at global, regional, national and local levels. Definition: Land Degradation Neutrality is a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales, and ecosystems.



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## Climate change and desertification of arid lands of European Russia

Alexander ZOLOTOKRYLIN, Tatiana TITKOVA, Elena CHERENKOVA, Vera VINOGRADOVA
(Russian Federation)

Desertification, in general, include aridization and drylands degradation. In European part of Russia at the end of the XX century, desertification consequences were alleviated by both aridization decrease and anthropogenic pressure weakening resulted by socio-economic changes of that period. As a result, composition of pascual vegetation considerably changes: percent of steppe species (graminoids) increase while wormwood area decrease. Area of early occurred anthropogenic desertification nidi (e.g. at the Black Lands territory) are diminished dramatically. Anthropogenic factor (pasture load) was the main regulator of desertification in this conditions. Aridization impact on desertification grows again in the end of XXIth century's first decade. Aridization intensified again, mostly in steppe pastures zone, in relation with droughts frequency increase. Special meteorological indexes, as well as satellite indexes (based on MODIS data), demonstrate more drought influence to steppe pastures, compared with desert pastures. Aridization rise reinforced anthropogenic degradation of steppe pastures, this tendency is proved by significant trends in NDVI (negative), albedo (positive) and surface temperature (positive). Thus, drylands aridization strengthening in the European part of Russia affected mostly to steppe pastures (summer's second half), with minor impact to desert pastures. New anthropogenic desertification nidi became near borders between steppe and desert pastures. During last few years, livestock population growth, that is significant desertification factor, became slower or came to stop. Evaluated prospective changes in yearly and seasonal moistening coefficients during period 2011-2013 years, in comparison with basic period 1981-2000 (according to CIMP5 data, received in Voeikov Main Geophysical Observatory through averaging results by 31 General Atmospheric and Ocean Circulation models ensemble).



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# The LaVaCCA project: Assessing land value changes and developing a discussion support tool for improved land use planning in the irrigated lowlands of Central Asia

Fabian LÖW, Elisabeth FLIEMANN, Christopher CONRAD, Victor DUKHOVNY, Nadija MURATOVA, Mirzakhayot IBRAKHIMOV, John LAMERS (Germany)

The LaVaCCA project, funded by the Volkswagen foundation (2015−2017), aims at analysing the spatial and socio-economic drivers of land use change in the downstream regions in Central Asia (CA), which lead to widespread agricultural land degradation and land abandonment, affecting food security. Immense losses of land productivity (LP) have been observed on eight million hectares of irrigated agricultural land in CA during the past decades. The aim of LaVaCCA is to develop satellite remote sensing based methods to analyse and quantify the extent and severity of land degradation and abandonment, and to assess associated changes in economic land value. First, hotspots of agricultural land abandonment were identified with methods based on satellite remote sensing. In a case study in Kyzyl-Orda, Kazakhstan, multi-temporal data sets from the free Landsat archive were classified to create annual land use maps between 2009−2014 with five classes. A novel decision-fusion approach was tested to combine the results from random forest and support vector machines. Although the single classifiers performed equally well, with annual classification accuracies between 85%−90%, the proposed fusion approach was significantly (i.e. at the 95% confidence level) more accurate, with overall accuracies ranging from 94−97%. The analysis of the temporal sequences of specific land uses between 2009−2014 at the per-field basis revealed that more than 20% of the agricultural fields in Kyzyl-Orda are abandoned. The observation length (i.e. the number of consecutive years) had a significant impact on the reliability of the method to detect agricultural land abandonment, ranging from 63.1% accuracy when only considering single years alone, and up to 78.5% when analysing the complete set of land use maps (2009−2014). The results will contribute to spatially explicit analysis of factors driving land abandonment in CA, which could be used to highlight areas for targeting rehabilitation measures like afforestation or pasture.



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# The new drought products: translating drought monitoring information to risk assessment and management in the dry lands

V. CAZAC, Mihail DARADUR (Moldova)

Development of drought risk assessment and management plans is an efficient approach to reduce drought impact and improve resilience in a changing climate. In many respects, the achievement of desired management goals depend on indicators and triggers to activate drought response actions. But determining those indicators and triggers still presents challenges. This study develops drought decision support tools that lead to more effective use monitoring information and decision making in a changing climate. It introduces a new drought index (Drought and Aridity Index, DAI) based on the supply and demand concept and designed using commonly available climate surface records. Unlike those already in use, the established index incorporates the temporal properties of precipitation over designed time period that are a fundamental aspect of climate in the dry lands. An effective system of drought decision-support tools to improve warning programs at all management levels have been developed. It allows accurately to represent Drought Sensitive Areas (DSAs) at high resolution and to upgrade existing tools for drought early warning based on the return level and waiting time concept. Average (F(t) =0.50) and a confident (F(t)=0. 95) return time of drought occurrence, as well as finite levels of drought severity that cannot be overcome in current climate are introduced. An extended and new hydro-meteorological services improving accessibility of the design information have been discussed. To improve accessibility and increased awareness, we working together with members of the agricultural community to form a partnership with the key stakeholders in developing new design products based on real-time web-based services combined with integrating guiding information.



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# Geochemical spreading of atmospheric aerosol in the landscapes of European Russia

Tatiana KUDERINA (Russian Federation)

The most dynamic component of landscape-geochemical systems is the atmosphere. Source of aerosols in the atmosphere - the underlying surface and long-range transport of matter. Atmospheric circulation of European Russia is characterized mainly by Western transfer with separate invasions of other areas. Experimental aerosol studies were carried out in the natural geochemical landscapes from the Arctic to the Caucasus. Landscape-geochemical approach used for the calculation of aerosol concentration coefficients (content in the atmosphere / earth's crust Clark). In the south of European Russia, the study of the chemical composition of the aerosol indicate the influence of the huge spaces of arid Central Asia at the southern and eastern air masses. In a stable atmosphere desertificated drylands of the Southern Federal District are the main sources of natural convective aerosol. When air masses passing through the industrial agglomeration, we have a regional anthropogenic pollution by heavy metals. Local atmospheric pollution comes from fossil fuel combustion and the impact of road transport. Natural landscapes of the central part of European Russia have low mass aerosol concentration as a whole. However, they are also experiencing anthropogenic impact at high speeds air masses. Subarctic and Arctic are the cleanest natural landscapes with the lowest concentrations of aerosol. In the surface atmosphere increasing concentrations of industrial chemical elements were observed only in the longtime transport of matter.



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**A Model for Utilization of nuclear power and unused fresh water resources to rejuvenate the fading /vanishing life of Karnataka, INDIA**

Venugopal VR (India)

It is an unbelievable tragedy that we find in my home state “KARNATAKA”. There is so much rainfall in the five districts of the western part of KARNATAKA state called “malenadu” meaning “the land of rain” that the water flowing from it to the sea through the numerous huge rivers can irrigate the whole Deccan plateau. But ironically most of the other districts of my home state KARNATAKA are rapidly turning in to deserts. This has actually happened over the last forty years in the in Kolar dist of Karnataka, that is under study by me as I come from it. Forty years ago there were open wells with fresh water from a depth of 20 feet below the surface of the ground. After constant tilling of the earth over the last 4 decades there is no water in even the 2000 feet deep bore wells. Then there were dew drops in the mornings on every leaf of the beetle leaf gardens. Now neither are there gardens nor are there dew drops. There are only dues in the banks and drops in the eyes. There is an urgent need to use SENSE and TECHNOLOGY to stop this desertification of the state on one hand and wastage of fresh water on the other. Here is a paper to appeal the international community to interfere, help and stop the vanishing of life in the process of the rapidly occurring desertification of my home state.



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## The Relevance of Cartography

*Professor Georg GARTNER (Austria)*

*Georg Gartner is a Full Professor for Cartography at the Vienna University of Technology. He holds graduate qualifications in Geography and Cartography from the University of Vienna and received his Ph.D. and his Habilitation from the Vienna University of Technology. He was awarded a Fulbright grant to the USA and several research visiting fellowships. He was Dean for Academic Affairs for Geodesy and Geoinformation at Vienna University of Technology. He is Editor of the Book Series "Lecture Notes on Geoinformation and Cartography" by Springer and Editor of the "Journal on LBS" by Taylor & Francis. He serves currently as President of the International Cartographic Association.*



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## Cultural complexity of contemporary nations

*Professor Valery TISHKOV (Russia)*

*Prof. Valery A. Tishkov is Professor of History and Anthropology, Scientific Guide of the Institute of Ethnology and Anthropology, Russian Academy of Sciences. He is also Director of the IEA Centre for the Study and Management of Conflicts. Prof. Tishkov is a former Minister for Nationalities in the Yeltsin government (1992) and acting member of the Russian State committee on migration policy. He participated working out Russia's concept documents and legislation in the field of minority and migration policy, served as advisory member of several international agencies and committees (UNHCR, UNESCO) and international research institutions (PRIO, UNRISD).*
*Prof. Tishkov is a distinguished scientist, author of many scholarly books and reference editions on ethnicity, minorities, migrations and conflicts. His two books published in English are Ethnicity, Nationalism and Conflict in and after the Soviet Union: The Mind Aflame (London: Sage 1997) and Chechnya: Life in a War-Torn Society (Berkeley: UCP 2004). He has conducted extensive field research on North American indigenous communities and research in conflict areas of the Former Soviet Union area, especially Caucasus and Central Asia. Prof. Tishkov is a founder and Director of the Network for Ethnic Monitoring and Early Warning and a founder of The Fund for Humanitarian Assistance to the Chechen Republic.*

**Abstract**: The usual phenomena we face every day frequently has very complicated definition and nation is one of them. This concept has many interpretations as every-day-practice category as academician one. Therefore, the question "What nation is?" is still important and should be discussed. The other issue I am going to touch upon is complex population composition of the states and dynamic of this complexity. Nowadays there are at least three maps of the world – political, ethno-linguistic, and confessional. How them combine with the world map of nations?
To answer the question a role of ethnic, language, religious and other cultural factor in national building as well as practice of construction of nation should be discussed.



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## 2016 International Year of Global Understanding (IYGU)

*Professor Benno WERLEN (Germany)*

*Benno Werlen is the Executive Director of the 2016 International Year of Global Understanding on the basis of a UNESCO declaration, which links the major scientific global umbrella organizations' efforts to achieve global sustainability. These organizations include the natural sciences (ICSU) as well as the social sciences (ISSC), philosophy and the humanities (CIPSH). Benno Werlen is currently a professor of Social Geography at the Friedrich-Schiller University Jena in Germany and a member of the European Research Council in Brussels in the field of Society & Environment.*

**Abstract:** Global thinking and global action demand global understanding. This initiative International Geographical Union (IGU) aims to bridge the gap in awareness between local acts and global effects through research, education, and information. Our world faces social, cultural, and economic change, as well as a changing climate. Human actions play a key role in creating such world-wide challenges. However, human actions also provide solutions. If individuals know what their day-to-day routines mean for the planet, they can take appropriate action. Global understanding helps overcome the knowledge-action gap and supports policy decisions that promote sustainability. The International Year of Global Understanding (IYGU) addresses the ways in which we inhabit an increasingly globalized world. How is everyone's life embedded in global socio-economical and bio-physical processes? How and with what global effects do we transform nature? How do we build new social and political relationships for the emerging global reality? Societies and cultures determine the ways we live with and shape nature. They influence how we perceive the global consequences of our everyday actions. We need to understand what our daily actions mean for the world as a whole in order to overcome global challenges.



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## Coping With a Fast-Changing, Unstable World: Opportunities and Challenges for Geography

*Professor Alexander MURPHY (USA)*

*Alexander Murphy is a Professor of Geography and the Rippey Chair in Liberal Arts and Sciences at the University of Oregon. He specializes in Political-Cultural Geography with regional concentrations on Europe and the Middle East. He is a past President of the Association of American Geographers and he currently serves as Senior Vice President of the American Geographical Society. He has been an editor of both Progress in Human Geography and Eurasian Geography and Economics. Dr. Murphy has authored or co-authored some 100 articles and book chapters, as well as several books, including Cultural Encounters with the Environment and Human Geography: Culture, Society, and Space. His work has been supported by grants from Fulbright-Hays, the U.S. National Endowment for the Humanities Fellowship, and the U.S. National Science Foundation. He has received distinguished teaching awards from the National Council for Geographic Education and his own university. Dr. Murphy was elected to membership in the Academia Europea in 2011. He recently chaired a study of the U.S. National Research Council outlining strategic directions for the geographical sciences. Dr. Murphy holds a Bachelor's Degree in Archaeology from Yale University, a Law Degree from Columbia University and a Ph.D. in Geography from the University of Chicago.*

**Abstract:** The rapid, far-reaching political, social, and environmental changes shaping our planet in the early decades of the twenty-first century make geographical understanding and analysis more important than ever. If geography is to play an increasingly constructive role in these difficult times, however, it will be important for geographers to make more active efforts to combat simplistic conceptions of the discipline on the part of the general public and to develop research agendas that cut across traditional topical and methodological divides. Meeting the former challenge requires efforts not just to write and speak in ways that can reach broader audiences; it also requires being explicit about what is lost if geographical conceptions, ideas, and techniques are marginalized. On the research front, some of the most important questions of our time lie at the intersection of traditional domains of geographic practice. Bridging the political and the environmental, for example, is essential to understanding the changing face of global conflict--as is working across the quantitative-qualitative divide.



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## A Continuing Agenda for Gender (Lecture by the Gender and Geography Commission, recipient of the inaugural IGU Award for Best Commission)

*Associate Professor Shirlena HUANG (Singapore)*

*Shirlena Huang is the current Chair of the IGU Gender and Geography Commission. She will be delivering her collaboratively authored lecture on behalf of the Gender and Geography Commission, which was awarded the IGU Award for Best Commission in 2015. The lecture is prepared by Shirlena Huang, Janet Momsen, Janice Monk, Maria Dolors Garcia Ramon and Joos Droogleever Fortuijn.*

*Shirlena Huang is Associate Professor of Geography and Vice-Dean (Graduate Studies) at the Faculty of Arts and Social Sciences, National University of Singapore. Her research focuses mainly on issues at the intersection of gender and migration, with a particular focus on care labour migration and transnational families within the Asia-Pacific region, as well as urbanisation and heritage conservation (particularly in Singapore). She sits on the editorial boards of International Journal of Population Research, Singapore Journal of Tropical Geography, Sojourn and Women's Studies International Forum, as well as the book series Asian Cultural Studies: Transnational and Dialogic Approaches (by Rowman & Littlefield).*

**Abstract:** This collaborative paper, written by the current and past chairs, as well as founding members of the Gender Commission, discusses the challenges faced by and contributions of the Commission in its 27-year history, and also considers the emerging directions and developments ahead. Indeed, the IGU Gender and Geography Commission has come a long way since it was first established – not without a fight, given that gender was not acknowledged by all geographers as an area worthy of geographical research – as a study group at the 1988 IGU Congress in Sydney. Today the Gender Commission has over 670 corresponding members in over 50 countries and a rich slate of activities, including annual pre-conference workshops and multiple sessions at IGU conferences, a twice-a-year newsletter and sponsorship of gender workshops in different parts of the world. The strength of the Commission's contribution to geography and the IGU was recognized in 2014 when it was awarded the inaugural Best IGU Commission Award. In this paper, we specifically highlight first, how the Commission, since its early days, has aimed to be alert to and inclusive of the multiple voices of feminist geographers from across the world; and second, in thinking about research that crosses international boundaries, how the Commission has worked towards collaborative projects and research that is of salience to audiences beyond the sub-discipline of gender. The paper ends by considering some of the challenges ahead for a continuing agenda for gender (co-authors: Janet Momsen, Janice Monk, Maria Dolors Garcia Ramon and Joos Droogleever Fortuijn).



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## Climate change and conflict in Sub-Saharan Africa

*Professor John O'LOUGHLIN (USA)*

*John O'Loughlin is a Distinguished Professor of Geography and Faculty Research Associate in the Institutions Program and the Institute of Behavioral Science at the University of Colorado. His research centers on spatial analysis of conflict, including its relationships with environmental change in Africa, as well as political geography of the former Soviet Union — from Russian and Ukrainian geopolitics to Eurasian de facto-states and ethno-territorial nationalisms. Dr. O'Loughlin has also published on the diffusion of democracy and the electoral geography of Nazi Germany. He is editor-in-chief of Political Geography since 1981 and also Editor-in-Chief of Eurasian Geography and Economics. He also serves on the National Geographic Society's Committee on Research and Exploration. He received his Ph.D. in Geography from Pennsylvania State University (USA)*

**Abstract:** Ongoing debates in the academic community and in the public policy arena continue without clear resolution about the significance of global climate change for the risk of increased conflict. Sub-Saharan Africa is generally agreed to be the region most vulnerable to such climate impacts. Using a large database of conflict events and detailed climatological data covering the period 1980–2012, we apply a multilevel modeling technique that allows for a more nuanced understanding of a climate–conflict link than has been seen heretofore. In the aggregate, high temperature extremes are associated with more conflict; however, different types of conflict and different subregions do not show consistent relationship with temperature deviations. Precipitation deviations, both high and low, are generally not significant. The location and timing of violence are influenced less by climate anomalies (temperature or precipitation variations from normal) than by key political, economic, and geographic factors. We find important distinctions in the relationship between temperature extremes and conflict by using multiple methods of analysis and by exploiting our time-series cross-sectional dataset for disaggregated analyses.



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## Addressing the Challenges of the Geography of Future Earth

*Professor Gordon MCBEAN (Canada)*

*Gordon McBean is President of the International Council for Science (ICSU). He is also a Professor in the Departments of Geography, Political Science and Physics at Western University and Co-Director of the Centre for Environment and Sustainability. He has served as Chair of the International Science Committee for the ICSU-ISSC-UNISDR Integrated Research on Disaster Risk Program; President of Global Environmental Change START International for building research capacity on addressing environmental stresses; and Convening Lead Author for the IPCC Special Report on Climate Extremes. From 1994-2000, he was Assistant Deputy Minister for the Meteorological Service of Environment Canada. He is a Member of the Order of Canada and the Order of Ontario. Dr. McBean shared in the awarding of the 2007 Nobel Peace Prize to the IPCC. He has also received the Patterson Medal for distinguished contributions to meteorology by a Canadian. He is a Fellow of the Royal Society of Canada, the American Meteorological Society, Royal Canadian Geographical Society and the Canadian Meteorological and Oceanographic Society.*



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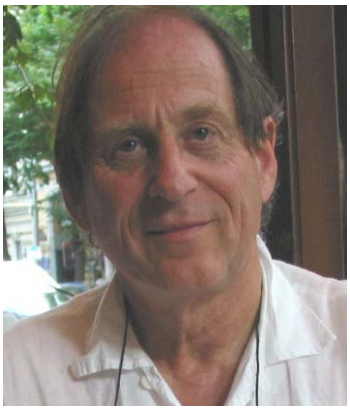
## The unpredictability of Nature: the Caspian Sea Level case

*Professor Salomon KROONENBERG (the Netherlands)*



*Salomon Kroonenberg (1947) is emeritus professor of Geology at Delft University of Technology, the Netherlands. He studied Physical Geography at the University of Amsterdam, and obtained his PhD at the same university in 1976 on a thesis about the Precambrian of the Guiana Shield in Suriname. From 1972-1978 he worked as a geologist at the Geological and Mining Service of Suriname, from 1978-1979 as a lecturer Physical Geography at the University College of Swaziland, Africa, and from 1979 to 1982 as a remote sensing geologist at the Centro Interamericano de Fotointerpretación in Bogotá, Colombia. In 1982 he was appointed as Professor of Geology at the Department of Soil Science and Geology at Wageningen Agricultural University, and in 1996 he moved to Delft University of Technology where he worked until his retirement in 2009. He supervised over 30 PhD students in Wageningen and Delft, and had extensive research programmes on sedimentary geology and sea level change in the Netherlands, France, Spain, Russia, Azerbaijan, Iran, China, Indonesia, Costa Rica, Colombia and Suriname. He cooperated for over 20 years with the Faculty of Geography of Moscow State University to study Caspian Sea level change. He is the author of over 130 scientific articles and about just as many abstracts at international conferences, as well as five books and over 100 Dutch-language articles in newspapers and non-specialist science magazines. He was chairman or member of several peer review committees in the Netherlands, Belgium, Estonia and Suriname. He is Honorary Professor at Moscow State University and speaks eight languages including Russian.*



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## Russian Geography: Specifics, Achievements, Problems

*Professor Vladimir KOLOSOV (Russia)*

*Dr. Vladimir Kolosov heads the Laboratory of Geopolitical Studies at the Russian Academy of Sciences Institute of Geography along with the Lomonosov Moscow State University World Economy Department. In addition to his academic responsibilities, he serves as president of the International Geographical Union and vice president of the Russian Geographical Society. Professor Kolosov's research integrates political, social and urban geography from local to global scales. His approximately 350 publications include 120 published outside Russia, 6 individual monographs and 11 edited compilations. He has been principal investigator or director of the Russian component for 30 research projects, with funding from sources such as the European Commission Framework Programmes, the Centre National de la Recherche Scientifique (CNRS), the National Science Foundation (NSF), the Fondazione Giovanni Agnelli and the Open Society Institute. Dr. Kolosov has been a visiting professor at universities in Finland, France, Spain and the United Kingdom. He has supervised dissertations in Russia and abroad. His many international distinctions include membership in the Société de Géographie, an honorary doctorate from the Université du Havre and scholarships from the Région de Bruxelles-Capitale and the Fulbright Program.*

**Abstract:** There are several distinctive characteristics associated with Russian geographical theory and practice. First, an orientation toward physical science has remained dominant for many years. Second, geography has been closely integrated with practical concerns such as territorial exploration (which continued in Russia until the early 20th century), regional planning, urban governance and primary industrial operations. Thus geographers rapidly applied theoretical models to meet state demands. Third, Soviet geography developed autonomously for extended periods while generally following global paradigms. Fourth, early integration of human and physical geography — despite their usual separation — resulted in advanced socio-environmental theory well before the emergence of "sustainable development". Fifth, resource exploitation in northern Russia has been an influential channel for geographical research. Dissolution of the Soviet Union radically changed the professional framework for Russian geographers. While this was a formidable challenge, it also brought new opportunities — from bolstering international engagement to stimulating interdisciplinary research on global environmental processes. Human geography became more attuned to poverty, unemployment, identities, conflicts, borders and other vital socio-cultural issues. Geographical projects and publications reflect the significant changes that took place in Russia over the past century



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# THEMATIC LECTURES

- The spatial control of "vices" in the U.S. military outpost: Value contradictions in a long-term stationing on foreign soil (Lecture is sponsored by the international journal Geopolitics)

  *Professor Takashi YAMAZAKI (Japan)*

- Leadership and excellence in learning and teaching Geography

  *Professor Karl DONERT (Austria)*

- Changing the Map: Future Visions of Virtual Maps

  *Professor Melinda LAITURI (USA), Dr Lee SCHWARTZ (USA), Dr Christopher TUCKER (USA)*

- Revolution of proximity: new chance for the Russian economic geography?

  *Professor Alexander PELYASOV, Dr. Nadezhda ZAMYATINA (Russian Federation)*

- The place names and identity

  *Professor Cosimo PALAGIANO (Italy)*

- Urban challenges in a complex world

  *Professor Céline ROZENBLAT (Switzerland)*

- The New Political Geographies of Sovereignty and Indignity

  *Professor Brad COOMBES (New Zealand)*

- From "pasta" to "poi": towards a critical geography of food

  *Professor Elena dell'Agnese (Italy)*



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## The spatial control of "vices" in the U.S. military outpost: Value contradictions in a long-term stationing on foreign soil (Lecture is sponsored by the international journal Geopolitics)

*Professor Takashi YAMAZAKI (Japan)*

*Takashi Yamazaki is a professor of Geography at Osaka City University, Japan. He received his Ph.D in political geography from University of Colorado at Boulder. His current research interest concerns the (de)militarization of Okinawa and critical geopolitics of Japanese foreign policy. His publications include "Space, Place, and Politics: Towards a Geography of Politics" (Nakanishiya, 2013 in Japanese) and 'The US militarization of a 'host' civilian society: the case of post-war Okinawa, Japan' in S. Kirsch and C. Flint eds. "Reconstructing Conflict: Integrating War and Post-War Geographies" (Ashgate, 2011).*

**Abstract:** Since the beginning of the Cold War, the U.S. has maintained its armed forces overseas. This "forward deployment" has been one of the key aspects in the power projection of the U.S. as a global power. For states such as Japan and South Korea where U.S. troops have been stationed, having the troops on their soil ensures their security in the surrounding region and contributes to the maintenance of U.S. global interests. However, hosting U.S. troops for a long time not only represents a continuing military dependence on the U.S. but also means that complex influences have been put on the local host society. Political, economic, and/or social aspects of U.S. postwar hegemony have often been channeled into host states through the stationing of U.S. troops. In this sense, large-scale U.S. military bases overseas, particularly in Asia, have functioned as outposts of U.S. imperial power and (western) universalistic values. Using the case of Okinawa, Japan and declassified military documents, this paper explores how U.S. troops diffused its social and legal values such as democracy, public health, and gender and racial equality into the region and how the troops came to take great pains in (spatially) controlling violations of these values (i.e. "vices") by both U.S. personnel and the locals. This paper reveals how inherent value contradictions between universalistic ideals and actual imperial domination in the outpost finally led to crises of the military administration over the host region



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## Leadership and excellence in learning and teaching Geography

*Professor Karl DONERT (Austria)*

Karl *Donert is a consultant and education specialist. He is Director of the European Centre of Excellence, digital-earth.eu, based at Salzburg University, Austria and Director of Innovative Learning Network. He is President of EUROGEO (the European Association of Geographers), a UK National Teaching Fellow who worked at Liverpool Hope University. He is Adjunct Professor at the University of Salzburg and was coordinator of the HERODOT Network for Geography in higher education. Current projects include the digital-earth.eu and School on the Cloud networks. He is Vice President of the Democracy, Social Cohesion and Global Challenges group at the Council of Europe, an expert to the European Commission in Brussels, an elected member of Academea Europea, and former Hon. Vice President of the Geographical Association. He researches and publishes widely on many aspects of geographical education, citizenship, the use of geo-media and new technologies and on the State of Geography in Europe.*

**Abstract:** "All the world is my school and all humanity is my teacher." - George Whitman

If I am a lifelong learner:

As a learner - What makes geography so exciting to learn? What essential geographical skills are needed to help me navigate the world?

As a teacher - How can excellent learning opportunities be developed? What leadership qualities are needed?

These are some of the questions that will be explored during this presentation, reflecting on my experiences as a learner and a teacher. I will try to unpack some of the key beliefs, ideas, people, contexts, places, subject knowledge and approaches that helped me, as a learner and teacher, make sense of my geography.



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## Changing The Map: Future Visions Of Virtual Maps By Lee Schwartz, Melinda Laituri And Christopher Tucker

*Professor Melinda LAITURI (USA), Dr Lee SCHWARTZ (USA), Dr. Christopher TUCKER (USA)*

*Dr. Melinda Laituri is a professor of geography in the Department of Ecosystem Science and Sustainability at Colorado State University. She is the Director of the Geospatial Centroid at CSU. Professor Laituri received her PhD from the University of Arizona in 1993. She is a Fulbright Scholar to Botswana at the Center for Scientific Research, Indigenous Knowledge, and Innovation, University of Botswana. She is Rachel Carson Fellow for Environment and Society at the Ludwig Maximillian University, Munich. Professor Laituri is a former National Science Foundation program officer in Geography and Spatial Sciences. She is currently a Jefferson Science Fellow working at the State Department in the Humanitarian Information Unit. Dr. Laituri is the Director of the Geospatial Centroid @ CSU (gis.colostate.edu) that provides information and support for GIS activities, education, and outreach at CSU and in Colorado. Dr. Laituri's research interests are diverse. She has worked with indigenous peoples throughout the world on issues related to natural resource management, disaster adaptation, and water resource issues using geographic information systems (GIS) that utilize cultural and eco-physical data in research models. A key focus is participatory GIS where indigenous peoples develop spatial information and maps essential for their management of their own resources. Other research work focuses on the role of the Internet and geospatial technologies of disaster management and cross-cultural environmental histories of river basin management.*



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*As Geographer of the United States, Lee Schwartz holds the position of the Director of the Office of The Geographer and Global Issues in the State Department's Bureau of Intelligence and Research. Schwartz is the State Department's 8th Geographer, a position that was established in 1921 and bears the statutory responsibility for providing guidance to all federal agencies on questions of international boundaries and sovereignty claims. He also oversees the Humanitarian Information Unit – a U.S. government interagency organization focused on unclassified data coordination for emergency preparedness, response, and mitigation. Dr. Schwartz earned his Ph.D. in geography from Columbia University and, prior to joining the Office of the Geographer, was a member of the faculty of The American University's School of International Service. At the Department of State, he has directed research and analysis on global issues primarily related to complex humanitarian emergencies and has coordinated related fieldwork and applied geography projects overseas, in particular in the Balkans, Central Asia, Russia, Afghanistan, Iraq, Sudan, the Horn of Africa, and Haiti. His work has focused on ethnic conflict, refugee flows, peacekeeping operations, strategic warning, and conflict mitigation and response – with an emphasis on Geographic Information Systems (GIS), Remote Sensing information coordination, and Participatory Mapping applications. Lee was the State Department's 2005 winner of the Warren Christopher Award for Outstanding Achievement in Global Affairs, the 2012 recipient of the Association of American Geographers' Anderson Medal of Honor in Applied Geography, and in 2014 was awarded the James Cullum Medal from the American Geographical Society in recognition of his distinguished service to the profession of geography.*



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*Christopher K.Tucker is the creator of MapStory.org, the atlas of change that everyone can edit. MapStory, as a companion to Wikipedia, is a new dimension to the global data commons that empowers a global user community that empowers people to organize and share their knowledge about the world spatially and temporally. Beyond being Chairman of the Board of Trustees of the MapStory Foundation, Chris is a Councilor of the American Geographical Society, sits on the Board of the Open Geospatial Consortium, the Board of the US Geospatial Intelligence Foundation, and has served on the National Geospatial Advisory Committee for the US Secretary of Interior. In a previous life, Chris was the CEO of a geospatial technology firm from startup to acquisition by ERDAS, where he served as SVP for the Americas and National Programs. Chris has his BA, MA and PhD from Columbia University.*

**Abstract:** Mapmaking is undergoing a revolution due to a combination of factors that include: new technological advances, participatory approaches to data collection, and access to the Internet. Maps are no longer only the purview of cartographers, but belong to an empowered group of citizens, scientists, and communities to create new geospatial data and representations. This thematic lecture explores dynamic maps and the expanding role of story maps where multi-media intersects geographic space. Integration of datasets, digital historical maps, and visualization techniques provide the basis for interactive maps that are multidimensional. The lecture will focus on the impact of new technology on cartographic products where the map has become a series of inter-related, complex layers from multiple sources. The relationship between authoritative and crowdsourced data will be examined discussing the need for strong data provenance standards. The increasing use and availability of satellite imagery will be described, assessing the role of image processing, interpretation and resolution on maps. We will examine specific examples focusing on products developed from recent humanitarian events around the world. We will conclude with a discussion on the future of maps and how they will be redefined at the intersection of the real and virtual worlds and the need to consider new forms of standards for cartographic development.



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## Revolution of proximity: new chance for the Russian economic geography?

*Professor Alexander PELYASOV, Dr. Nadezhda ZAMYATINA (Russian Federation)*

Professor Alexander *Pelyasov is the head of Center for the Arctic and Northern economies under the Council for the Study of Productive Forces (SOPS). He is the chairman of the Russian section of the ERSA (European Regional Science Association). His scientific interests embrace Northern economic development, innovative modernization of Russian cities and regions, EU experience of spatial development and regional policy. He is the author of more than 175 scientific, including 20 monographs.*

Dr. Nadezhda *Zamyatina is the Leading Researcher at Lomonosov Moscow State University, the Faculty of Geography. She is also the expert in municipal and region strategic planning projects (mostly in Russian Arctic zone), a researcher in the Center for the Arctic and Northern economies under the Council for the Study of Productive Forces (SOPS), a lecturer in the Moscow school of social and economic sciences – «Shaninka»* (the course of city branding). Nadezhda *Zamyatina is the author of more than 120 scientific publications in the fields of regional development, territorial structures, cultural, cognitive and institutional geography, migrations and social capital – with a special emphasis to frontier zones.*



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**Abstract:** Geography always deals with the interaction of different agents within the space with the formation of local geosystems and complexes. This interaction goes through different directions: climatic, geochemical, biosystem and socio-economic. The theory of proximity is a very powerful tool for the study of such interactions. A common feature of all modern phenomena in the sphere of location of productive forces (clusters, industrial districts, urban agglomerations and others) is that: all of them in unprecedented degree are actualizing the proximity effects, both spatial and institutional (organizational, social, cognitive). This may seem a paradox, but never before the geographical and non-geographical proximity has been so fundamentally important and never did it play such a crucial role in regional economic development, regional policy, in learning processes - as in the modern era of globalization, information technologies and telecommunications. Both for the Russian and the international school of economic geography, this is good news. This interdisciplinary approach gives the right of intellectual leadership to our science within the multidisciplinary umbrella of social sciences. Profound understanding of contemporary socioeconomic processes in the Russian space is impossible without attracting apparatus of the theory of proximity developed by André Torre, Ron Boschma and other European regional scholars. Summary of articles of European authors and first studies on the Russian material allows us to offer seven priority directions for further development of the approach in the theory of proximity.



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## The place names and identity

*Professor Cosimo PALAGIANO (Italy)*

*Since 2011 Cosimo PALAGIANO is professor emeritus of the University of Rome La Sapienza. He also is corresponding member of the Academy of Arcadia, of the Accademia Nazionale dei Lincei, of the Istituti di Studi Romani. In 2011 he was appointed Chair of the IGU Commission / ICA Working Group on Toponymy. Professor Cosimo PALAGIANO is the author of numerous studies of physical geography (karst and volcanic, climatology), human geography (urban settlement, cultural heritage), of historical geography and history of cartography) and economic geography (trade and industry). Professor Palagiano actively collaborates with public and private institutions especially in the field of cartography and GIS (Geographic Information Systems) , with Telespazio, Esri, the Presidency of the Council of Ministers, European Space Agency , CIGA (Centre of Aeronautical Information Geo-topografiche), Province of Rome , etc. He is part of the Editorial Board of the journal "Geography, Environment, Sustainability" published by the Russian Geographical Society and the magazine "Espacio y tiempo" of the Faculty of Educational Sciences of the University of Seville .*

**Abstract:** I would like to discuss about the problem of identity. Usually the name of a place draws identity from its settlement, but the problem is very complex.

It is possible that vice versa identity has being connected with the settlement itself, depending on the historical, political, cultural, religious factors. In addition, two different communities can live together in the same place, which can take on different names. But this can produce some conflict. For me it is essential in this connection between identity and place name occurs for the following reasons:

(I) Feeling of the population to be aware of the identity;

(II) Long-established name, which has not changed over time;

(III) Prolonged religious content.

At a recent meeting of the Division Romano-Hellenic dell'UNGEGN held in Florence I presented a report on the Genius Loci. Today architects* give to the Genius loci a value other than what the Romans had given. While the Romans gave to the genius loci protracted religious value, and so very deep, architects awarded the title of genius loci of a place for its formal and spectacular such as to attract the attention of visitors.

* In particular I refer to Christian Norberg-Schulz,

Genius Loci, Towards a Phenomenology of Architecture Rizzoli, New York. 1980.



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## Urban challenges in a complex world

*Professor Céline ROZENBLAT (Switzerland)*

*Prof. Céline Rozenblat (female) focuses her research on the effects of multinational firms networks on cities systems' evolution in multi-level territorial processes. She has organized workshops for high-level policy makers (French IHEDAT), and produced numerous comparative studies of cities for planning institutions as DATAR in France or ESPON in Europe. She participates currently to the FET MULTIPLEX FP7, a project lead by physicists on complex networks and she leads the FNS LOGIICS project on the integration of Chinese and Indian cities in the globalization. She is President of the Urban Commission of the International Geographical Union (IGU) and coordinate the Territorial Intelligence Dep. of the Unitwin UNESCO Digital Campus of Complex Science. She is in the Executive Committee of the Complex Science Society.*

*Selected publications:*

*Rozenblat C., Mélançon (eds.) (2013). Multilevel analysis and visualization of geographical networks, Springer, Methodos Series, n°11*
*Hu, Y., Zhou, D., Zhang, R., Han, Z., Rozenblat, C., & Havlin, S. (2013). Percolation of interdependent networks with intersimilarity. Physical Review E, 88(5), 052805.*
*Garas A., Argylakis P., Rozenblat C., Tomassini M., Havlin S. (2010). Worldwide spreading of economic crisis, New Journal of Physics 12 (2010) 113043, arXiv:1008.3893v1 [physics.soc-ph].*

**Abstract:** In the context of knowledge and information societies, new tendencies in the long/medium term evolution of urban systems, together with new data and methods, require that existing theoretical assumptions and conceptualizations would be challenged as global urban hierarchies are reconfigured. The connection between urban systems at different scales becomes more and more relevant for understanding urban systems and their transformations. But the inter-urban perspective is not sufficient to encompass these dynamics. Local networks are involved in macrogeographical level, mutual reinforcing of their overall radiation to other cities. Doreen MASSEY clearly expressed it for London: « the local is not only the product of the global, but that global itself is produced in local places » (2006, p.107). Therefore the reticular process operating within cities is directly related to city type of centrality at intercity level, needing to formalize further the « local buzz, global pipelines » (Bathelt et al., 2004) at the world scale. The evolution of power distributions inside and between cities reshapes the world organization of central/peripheral cities and the complexity of the global urban system. Actors as multinational firms, or high level innovation centers, participate actively to these reconfigurations that imply the concentration of wealth, of control, of innovation and of attractiveness in few cities. In the complexity of this multilevel system, how regionalization of the world is reshaping in a multipolar urban world? The methodologies derived from sciences of complex systems bring about new forms of intelligibility on these urban dynamics.



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## The New Political Geographies of Sovereignty and Indignity

*Professor Brad COOMBES (New Zealand)*

Brad *Coombes (Kati Mamoe, Ngati Kahungunu) lectures in Geography and Environmental Management at the School of Environment, The University of Auckland. His research explores the intersections amongst Indigenous rights, environmental justice, natural resource management and community action, and he has long been involved as a researcher in the claims settlement process of New Zealand's Waitangi Tribunal. Brad is Director of Te Whare Kura: Indigenous Knowledges Peoples and Identities – a Thematic Research Initiative of The University of Auckland which brings together 185 of its Maori and Pacific staff in collaborative research projects. Since 2010, he has also been Chair of the Indigenous Knowledges Peoples and Rights Commission of the International Geographical Union.*

**Abstract**: There has been considerable debate about whether approaches to Indigenous self-governance in natural resource management provide for Indigenous peoples' self-determined development or rather draw them into state polities and systems of control. This presentation examines two broad types of self-governance in 'customary' fisheries management for the Kaipara Harbour, New Zealand: Maori communities' self-assertions of authority which seemingly bypass all forms of state authorisation; and state award of self-governance rights which offers more formalised Maori control over area-based management units. It is suggested that less formal approaches have been more relevant to the everyday circumstances and political strategies of local sub/tribes. Ultimately, however, both official and unofficial attempts to manage independently are compromised by the actions and authorities of non-local fishing interests, as well as other exogenous flows of authority, interest and natural processes. Accordingly, the reality of relational sovereignty is discussed, as are the associated shifts in conceptualising Indigenous sovereignty which will be required to better conceptualise and lobby against that reality. It is suggested that social scientists should redirect their attention from formal collaborative regimes and towards the everyday acts of cultural resurgence that are the being and becoming of truly Indigenous selfdetermination.



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## From "pasta" to "poi": towards a critical geography of food

*Professor Elena dell'Agnese (Italy)*

*Elena dell'Agnese teaches political geography and cultural geography at the University of Milano-Bicocca, where she is also Director of the Centre of Visual Research. Her work has been mainly focused on developing a large spectrum approach toward "peripheral geographies". For this reason, she is interested in any form of, apparently innocent, "geo-graphical representation", from movies to television drama, cartoons and popular music, with a specific attentions towards political, gender and race issues. Recently, she has started working on a more-than-representational approach to border landscapes. She has been publishing extensively on these topics, mostly in Italian, but also in English, French, Spanish, Bosnian and Croatian. Elena dell'Agnese is Council Member of the Società Geografica Italiana and Chair of the Association of Italian Geographers Study Group on "Media and Geography". After chairing the IGU Commission on Political Geography from 2012 to 2014, she is now Vice-President of the IGU.*

**Abstract**: From the point of view of political geography, food is usually taken into account only as a resource, or in the perspective of "food security". What we eat, on the contrary, may acquire a strong political taste, not only because we can, or cannot, eat it, but also because of its cultural flavor and its symbolic meaning. Even if what we eat is generally the result of centuries of crosscultural encounters and exchanges (what is more post-colonial than "spaghetti al pomodoro"?), we tend to connect our food with our local history and tradition, assigning it a relevant role in our everyday practices of "banal nationalism" (what is more Italian than "spaghetti al pomodoro"?). In the same vein, different eating habits and manners are easy targets of processes of "Othering", while what we do is absolutely acceptable. Eventually, in a global world, eating a "local food" (like the "poi") may represent an act of cultural and political resistance, while cultivating it is a form of non violent re-territorialization. As such, critical political geographers should analyze it.



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# Quantifying documentary proxy records of high wind events

*Marie-Jeanne S. ROYER, Sarah DAVIES, Cerys JONES (United Kingdom)*

Climate change scenarios predict an increase in the occurrences of extreme weather events. In the current context of change, historical climatology provides information on the range of natural variation of climate and the occurrence of extreme events as well as allowing us to investigate the images, perceptions, social representations, vulnerabilities and adaptations to these events. Our current project investigates extreme weather events in the UK over the last 300 years using proxy documentary data. The case study we are presenting is based in Powys, Wales. For this study, we have access to long-term diaries describing the weather (1808-1893) that go beyond the timescale of available measure weather data. We are currently codifying the extreme wind elements present using a fixed analysis grid based on the Beaufort scale and the CLIWOC multilingual meteorological dictionary. The resulting information is then triangulated with available overlapping weather station measurements (1876-1893, 18 years) to ascertain the quality of the codification and the source material. The direct result of this endeavour will allow us to push back our knowledge of extreme wind events to the first part of the 19th century in Powys, Wales. We are also looking at a second case study in Northern Wales for the 18th century. The use of a fixed analysis grid would allow this methodology to be applied to various other documentary sources. If successful we also wish to broaden this methodology to other types of extreme weather such as droughts, floods, precipitation and temperature. By increasing our knowledge on the frequency and intensity of historical extreme weather.



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# Pros and cons of climate change in China

*Shaohong WU, Jikun HUANG, Yanhua LIU, Jiangbo GAO, Jun YANG, Yunhe YIN, Hao LUAN, Wanlu DONG (China)*

This study summarized the impact of climate change on natural ecosystems, natural resources, three industry, social system and natural disasters in China. Climate change strongly affected the structure and functions of natural ecosystems, for example, the vegetation productivity decreased in the Northeast permafrost region due to the higher temperature and less precipitation, while in the Tibetan Plateau, the vegetation productivity increased, owing to the improved thermal resource. Climate change led to the reduced precipitation in North and Northeast China and thus the reduced surface runoff. The public energy needs were changed because of climate change, e.g. the shorter heating period in winter. Climate change profoundly influenced human health, pathophoresis and major projectsby increasing extreme events, including frequency and magnitude, and causing more serious water shortage. Under the background of climate change, although the improved thermal resources can be helpful for extending the crop growth period, more extreme events may resulted in more instability in agricultural productivity. Not only did climate change indirectly affect the secondary and tertiary industry through the impacts on agriculture and natural resources, but also climate change mitigation measures, such as carbon tax, tariff and trading, had extensive and profound influences on socioeconomic system. Further analysis indicated that the impact of climate change presented significant regional differences. The impact had its pros and cons, while the advantages outweighed the disadvantages.Based on the above analysis on the impacts of climate change, we put forward suggestions on coping with climate change.



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IGU 2015 – 0886

# Fluctuations in the global atmospheric circulation in the XX-XXI century

*Nina KONONOVA (Russian Federation)*

Fluctuations in the global atmospheric circulation in 1899-2014, in the classification by BL Dzerdzeevskii considered. Three circulation epochs identified. Frequency elementary circulation mechanisms (ECM) in each epoch analyzed. Long-term fluctuations in mean annual air temperature in Northern and Southern hemispheres and the global and also the annual amplitude of air temperature due to changes in the nature of atmospheric circulation are analyzed. Particular attention is paid to the modern period (1998-2014). During this period, in the lower troposphere maximum meridional transport of air masses is observed (on average 335 days per year). In 93 days on average per year macroprocesses cyclones at the poles, without blocking processes, with three or four cyclones outputs of low to high latitudes in each hemisphere observed (type 13). On other days macroprocesses with anticyclones at the poles, the outputs of the cyclone low to high latitudes in two-four quadrants of each hemisphere and the Arctic/Antarctic invasions in their rear, forming a blocking process (types 8 to 12) are marked. As a result, the average annual air temperature in the Northern Hemisphere has ceased to rise, and in the Southern Hemisphere it dropped slightly. Due to the growth of the length of the high pressure in winter and summer annual amplitude of air temperature was the highest for the entire observation period. Because of the high pressure over Eurasia winter Atlantic cyclones go to the Arctic, ice in the Kara and Barents Seas decreases. Simultaneous outputs cyclones in different sectors cause the occurrence of natural hazards in different regions.



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# Projected changes in aridity/humidity over China in the future

*Yunhe YIN, Danyang MA, Shaohong WU, Tao PAN (China (Beijing))*

The effects of aridity on ecosystems and water cycles are pronounced and have received considerable attention. However, aridity changes due to future warming and its regional variability over China remain uncertain. Here we aims to identify the spatiotemporal variations in aridity and its key influencing factors over China in the mid-21st century based on five general circulation models (GCMs) and four representative concentration pathway (RCP) scenarios. An aridity index (AI), defined as the ratio of reference evapotranspiration (ETo) to precipitation (P), was calculated. We show that the GCM ensemble means are able to reproduce the variation of aridity during the baseline period. Generally, ETo anomalies are consistently positive. Other than for the RCP2.6 low-emission scenario, precipitation and aridity are both projected to increase. There are pronounced regional differences in aridity changes; i.e., wetter across most of western China and drier across most of eastern China in the mid-21st century. Negative AI anomalies in western China can be attributed mainly to the projected increase in precipitation. In eastern China, the AI was higher despite positive precipitation anomalies, due mainly to the greater effect of climate change on increasing atmospheric moisture demand. This suggests that evapotranspiration demand should be incorporated into aridity changes under future warming.



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**Long term variability of the deep and bottom water mass in the Atlantic Ocean**

*Evgeny KRAYUSHKIN, Alexander DEMIDOV, Illarion MIRONOV, Nina KALASHNIKOVA (Russian Federation)*

Studying of the long term variability of thermohaline characteristics in deep ocean are usually based on results of numerical modeling and often are not connected with the real objects of the investigation - water mass. In the present work averaged characteristics of the main water mass in the Atlantic Ocean were detected using repeating in situ Transatlantic section data from begging of XX century and up to nowadays. According to this approach it was possible to reveal the trends of thermohaline characteristics changes in deep and bottom water mass layers using the method, developed by the authors. Volume mean values were calculated for the whole water parcels as well as for its cores. Derived thermohaline trends for time frame 1920e – 2000e in the southern part of the Atlantic Ocean didn't reveal strong averaged warming deeper 500 m and in the deepest layer of the Atlantic Ocean cooling has been even shown. Another goal of this work is to determine the Atlantic Ocean water mass variability according the results of numerical models of ocean circulation (models SODA2, ECCO2, ORA4 and etc). The results of some numerical models allow us to average over the decades, years and months, and calculate transport for the zonal sections. We estimate water masses transport and total mass and heat fluxes for these sections and key areas ( for Gulf stream, in the Denmark and Gibraltar Straits and etc), and assess the intensity of the Meridional overturning circulation.These calculations are compared with those obtained during the measurements at hydrographic sections, where the differences are determined and analyzed. According to the model to estimate water mass characteristics variability. The work was supported by Russian Geographical Society and by Russian Fund of Fundament Research Grants № 14-05-31438, 13-05-00972, 14-05-00841.



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IGU 2015 – 1255

## Extreme cyclone activity changing over North Atlantic

*Natalia VIAZILOVA (Russian Federation)*

The goal of study is to show the cyclone activity variability over North Atlantic during winter (from October to March) and summer (from April to September) seasons from 1948 to present based on NCEP/NCAR reanalyses data set. The cyclone activity indices (cyclone tracks, cyclone frequency, the cyclone intensity, maximum storm wind) were calculated based on automated cyclone detection/tracking algorithm and the 6-hourly MSLP gridded data. Maximum storm wind was calculated as maximum surface wind near cyclone centers. Extreme cyclones were defined, as cyclones with an MSLP of 970 hPa or less. Extreme windstorm events were defined as cyclone with maximum storm wind that more 24 m/sec. Analyses shows, that in high-latitude zone of North Atlantic frequency and integral intensity for extreme cyclones and extreme windstorms significantly increased, as in winter, as in summer seasons, especially during last two decada. At that time, frequency for moderately cyclone significantly decreased from 1948 to early 1990 as in winter, as in summer seasons. Baltic region is outstanding by most increasing of extreme cyclone activity in North Atlantic. Significant part of extreme windstorms are accompanied by extreme sea level pressure over cyclone centers. The increase of the extreme windstorms frequency over North Atlantic related to increased track density and frequency of extreme cyclones.



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IGU 2015 – 1406

# Experience in assessing variability of the regional climate on the example of studying characteristics of humidification for the southeast Western Siberia

*Larisa NEMIROVSKAYA (Russian Federation)*

Current studies of global warming indicate heterogeneity of its manifestations in interhemispheric, latitude-longitude, and regional scales. Due to the extent of the territory and diversity of environment and economic conditions in Russia, it is advisable to assess these manifestations with reference to specific regions. The study was performed for the southeast of Western Siberia since 2011, for the Urals since late 90s and 2007-2011. The most important concepts were: a) the choice of rarely used moistening parameter: continuous periods of precipitation presence and absence, due to its high informative value in predicting unfavorable weather conditions; and b) the application of several criteria of the phenomenon: 1) close to the standards of Climate Datasheets, and 2) recommended by the IPCC. The main stage of the study was the creation of specialized databases for natural zones of the area, having both independent (ensuring completeness of information on regional climate system manifestations) and applied (information for users) significance. The main aspects of the study were: a) investigation of regional characteristics of climate variability, and b) probabilistic and statistical evaluation of the possible presence of studied periods (to specify moisture supply in the region). The calculated values of spatio-temporal and interannual variability contain information about the spatial and seasonal features, and probabilistic climatic assessment of their possible presence and trends in interannual changes. The studied periods may be considered as indicators of regional aspects of climate variability, and used for improvement of the hydrometeorological support of the economy.



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**Heat budget of the upper mixed layer in the North Atlantic**

*Pavel SUKHONOS, A.B. POLONSKY (Russian Federation)*

The role of different physical mechanisms in generation of temperature anomalies in upper mixed layer (UML) of the North Atlantic is investigated using data from ocean re-analysis ORA-S3 for the period 1959–2011. It is found that interannual-to-interdecadal variations of the UML heat budget are mostly controlled by advection and horizontal mixing. The local derivation and contribution from the heat fluxes on the upper and lower boundaries of the UML in the interannual-to-interdecadal temperature change are insignificant. The contribution of the zonal heat advection exceeds 90% in the Gulf Stream region and the East Greenland Current, while meridional heat advection in the Labrador Current and the inner part of the subpolar gyre dominates. In the Gulf Stream and the Guiana Current regions, contribution of the meridional heat advection is relatively low. This is due to underestimation of the reanalysis velocity of boundary currents. The largest contribution of the vertical heat advection is in the equatorial region and the West African upwelling, as well as in the central part of the subtropical gyre. The smallest contribution is on the southern border of the subtropical gyre, in the Gulf Stream and the Guiana Current, as well as in the subpolar gyre.



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## Basic Features Of Seismic Signals And Noise At The Vorkuta Seismic Station

*Svetlana KISHKINA, D. LOCTEV, A. SPIVAK (Russian Federation)*

Cultural development of new subpolar areas of Russia is associated with a need for detailed seismic research, including both mapping of regional seismicity and seismic monitoring of specific mining enterprises. Of special interest are the northern territories of European Russia, including shelves of the Kara and Barents Seas, Yamal Peninsula, and the Timan-Pechora region. Continuous seismic studies of these territories are important now because there is insufficient seismological knowledge of the area and an absence of systematic data on the seismicity of the region. Another task of current interest is the necessity to consider the seismic environment in the design, construction, and operation of natural gas extracting enterprises such as the construction of the North European Gas Pipeline. Issues of scientific importance for seismic studies in the region are the complex geodynamical setting, the presence of permafrost, and the complex tectonic structure. The existing subpolar seismic stations do not cover the extensive area between the Pechora and Ob' Rivers. Continuous recording at the seismic station IDG RAS near the city of Vorkuta has been conducted for the purpose of regional seismic monitoring and, more specifically, detection of seismic signals caused by local mining enterprises. The present study considers basic features of seismic signals and noise at the Vorkuta station. Microseismic Noise in Northern European Russia: Seismic Recordings in the Town of Vorkuta S. B. Kishkina and A. A. Spivak. Journal of Volcanology and Seismology, 2010, Vol. 4, No. 4, pp. 284–294. Short-Period Seismic Noise in Vorkuta, Russia. Kishkina, Spivak, Sweeney. Seismological Research Letters.2009; 80: 97-101 This research is support by RFBR 13-05-00950



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IGU 2015 – 2140

## Holocene lithalsa at the Sentsa River valley, Eastern Sayan

*B.Yurij VASIL'CHUK, Nadine BUDANTSEVA, Julia CHIZHOVA, Alla VASIL'CHUK, Sergey ALEXEEV, Sergey ARZHANNIKOV, Ludmila ALEXEEVA, Anastasia ARZHANNIKOVA (Russian Federation)*

A lithalsa has been studied in the Sentsa River valley, Eastern Sayan, Buryatia. This is the first detailed study of permafrost in the Eastern Sayan Mountains, based on analysis of the cryostructure and distribution of stable isotopes of oxygen and hydrogen from the ice and ice-soil core of the injection-segregation-type lithalsa. Reticulate chaotic and lenticular cryostructures dominate in the core of the lithalsa. The ice content exceeds 50-60%. The vertical and lateral distribution of the stable isotopes of oxygen and hydrogen favours the cascade lithalsa formation at the first stage of an ice-soil core of a large lithalsa. An ice-soil core of a small lithalsa formed at the second stage. Nucleation and initial growth of the lithalsa occurred at the stage of shallowing of the lake. Water feeding of lithalsa is mainly due to ground water from freezing suspension, but atmospheric and lacustrine types of feeding may occur also. The growth rate of the lithalsa is usually quite high and may reach ten centimetres per year. Lithalsas 50-100 years old and more than five metres high are usual. This work was financially supported by Russian Scientific Foundation (grant RSF № 14-27-00083)



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**Nature management and ecosystem degradation in the Russian Arctic**

*Alexander EVSEEV (Russian Federation)*

Considerable changes in nature management patterns in the Russian Arctic occurred at the second half of the 20th c. Industrial nature management forces out traditional aborigine and based on biological resources exploitation patterns. Exploitation of rich mineral resources deposits caused intensive infrastructure and population growth, changes in methods of economic development. These was followed by anthropogenic load increase on fragile arctic ecosystems which provide important global and regional ecological services. Territories with great changes of natural ecosystems were revealed. They are connected with environmental pollution, mechanical disturbances of soils and terrain, cutting of protective northern taiga forests, reindeer pastures degradation etc. 9 large impact zones were formed. The total area of ecosystems which experience the anthropogenic influence is about 900 th. km2, i.e. nearly 3% of the discussed region. The highest degree of degradation is typical for the territory of 80 th. km2. Further economic development may cause enlargement of such territories. For example, only hydrocarbons deposits development increases territories with ecosystems disturbances by several thousand ha annually. The Arctic Doctrine adopted by the Russian Federation stipulates economic development supplemented by thrifty use of natural resources which demands not only technological modernization, but ecologically reasonable optimization of nature management structure as well.



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# Cold Region Environments observations for prosperity, resilience and sustainability: introduction to the discussion

*Tatiana VLASOVA (Russian Federation), Nancy DOUBLEDAY (Canada)*

Nowadays a lot of observation and monitoring programs, projects and networks exist in Cold regions: Arctic, Antarctic and High Mountains. They differ according to the objects of observations: climate change, sea-ice melting, biodiversity dynamics, quality of life conditions and human capital development of local people, etc. They implement different approaches and methods derived from both biophysical and social sciences. These projects and networks cover diverse biomes, all Arctic states, many administrative, socio-ecological systems at different scales. Nevertheless it is needed to have wide geographical picture of such monitoring programs, projects and networks to have necessary knowledge of happening ecological and socio-economic as well as cultural changes at the pan-Arctic as well as Cold regions scales. The aim of this session is to gather fruitful data about existing observation systems, approaches and ideas concerning monitoring change, get more deep and territorially wide information on common and specific features of happening ecological and socio-cultural processes and identify possible future trends. Special attention will be put to the ways local communities, both indigenous and non-indigenous participate in observations and monitoring activities providing their traditional and local knowledge and perceptions of on-going changes. Also it would be interesting to discuss how this traditional and local knowledge is recognized and used by scientists as a valuable data source which can enhance scientific studies of the Cold region environments change and producing recommendations for decision makers and developing strategies for resilience building, pro-active adaptation and sustainable development at different scales – from local, pan-Arctic to global.



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## Palaeolothic paintings conservation in cave Kapova (Shulgan-Tash)

*Yury LYAKHNITSKY (Russian Federation)*

The unique palaeolithic painting of cave Kapova is in the danger of degradation in connection with influence of complex of natural negative factors main from that are microclimatic and hydrological ones. The morphological and geological features of cave assisted to the intensive penetration in the cavity of superficial air that caused to the moistening of the walls, formation of condensed waters, as well as the corrosion of pictures and the diffusion of dye. The active infiltration and influation of karstic waters from canyon Chaos, located above the east area of cavity, is realized in the halls of ground floor of the cave. The long-term researches conducted by the group of VSEGEI and commission of karstology and speleology of the Russian Geographical Society allowed substantially to improve a situation.

In a warm season, with the aim of the prevention of penetration in cavity of «overhead» warm air current, the easy screens are set in the cavern near the microclimatic barriers that improve a microclimatic situation visibly. The decline of moistening in the hall Chaos near the composition "Loshadki zala Chaos" was observed after the tamponage of the ponor "supplying" the moisture niduses in this hall. The complete drainage of hall Chaos is impossible in connection with the intensive karsting of Pescherny massif in which cave Kapova is situated. The composition "Loshadki zala Chaos" is run to the most danger. This composition was unsealed by the restorers of O.N. Bader from under powerful dripstones, but restoration works were shut-down subsequently. Till now the methodology of colorful layer fixing is not worked out in Russia as in our country the restorers specialized in this scientific direction are absent. The invitation of the specialists from the France is planned. A large danger for safety of painting was presented by a tourist route with the show of originals of pictures on the ground floor of cave that was organized by reserve in the ninetieths.

In the ninetieths of last century the tourist route elaborated on the base of the originals of Palaeolithic pictures which had a big danger for the safety of painting. At the beginning of this century the access in the internal districts of the cave is stopped. The small tourist route created near the entrance of the cavern with the copies of pictures.

Now the Catalogue of pictures and signs of cave Kapova contains the complex descriptions (photos, computer treatments, charts of topographical attachment etc.) of 195 images. The collected material convincingly testifies to existence in the Palaeolithic of the second original center of the most ancient culture on the South Ural, similar to Western-European one in France and Spain, but having substantial features. The proceeding researches, the organization of the specialized Museum-reserve allow to hope that the most ancient painting of the Eastern Europe will be stored for future generations.



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**Smoke events over boreal Eurasia: optical properties, radiative effects and air pollution**

*Gennady GORCHAKOV (Russian Federation)*

Smoke aerosol properties and effects during forest fires over Russia in XXI century have been analyzed. Investigation of large-scale smoke hazes in European Russia in 2002 and 2010 let us to find out main peculiarities of a smoke aerosol including remarkable optical and microphysical properties, among them decreasing in conditions of dense smoke a degree of linear polarization of scattered light to 0.1 and even to 0.15, a predominance a fine mode contribution in the solar radiation extinction and a fairly weak light absorption ("white smoke") [1]. The presence of dense smoke in the air changes significantly the radiation and heat balance of the atmosphere and underlying surface. An impact of the smoke aerosol in the radiative regime of the atmosphere was evaluated by the value of aerosol radiative forcing at the top and at the bottom of the atmosphere. Heating of the smoke layer by shortwave solar radiation was calculated. Under dense smoke conditions heavy air pollution in the surface layer of the atmosphere is observed. Aerosol and gaseous impurity variation concentrations in the smoky atmosphere were studied. Extreme concentration of the aerosol and carbon monoxide were documented in summer 2010 at the monitoring stations in Moscow region. This work was supported by the Russian Science Foundation under grant 14-47-00049. References 1. Gorchakov G.I., S.A. Sitnov, M.A. Sviridenkov et al. Satellite and ground-based monitoring of smoke in the atmosphere during the summer wildfires in European Russia in 2010 and Siberia in 2012 // Int. J. Remote Sensing. 2014. V. 35, No15. P. 5698-5721.



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# Seasonal variations of near-surface carbon monoxide (CO) concentration in central Siberia in 2007 – 2012, according to ZOTTO observatios and model simulation

*Yury SHTABKIN (Russian Federation)*

Over the recent decades, changes in air composition have been observed not only near industrial centres, but also in faraway from big towns regions. Here is some results of analysis of 2007 – 2012 near-surface carbon monoxide (CO) concentration observation data from Zotino tall tower observatory (ZOTTO) in central Siberia. The chemical-transport model GEOS-Chem was used to make numerical assessment of climatically important natural and anthropogenic emission sources impact on observed CO seasonal variability. According to the results, during the cold period CO concentration in the surface layer is largely driven by the influence of air transfer from anthropogenic sources in Western Europe (up to 20 ppb), south of European Russia (up to 35 ppb) and south-west of Siberia (up to 28 ppb). During the warm period it is usually affected by the air transport from eastern Siberia, where the main contribution to emissions gives biogenic VOC oxidation (up to 15 ppb) and wildfires (up to 12 ppb). These results indicate a significant role of long-range air transport compared with regional natural and anthropogenic sources of air pollution in the total balance of surface CO. It should be considered in the quantitative analysis of the factors that determine the long-term evolution of the lower troposphere of the continental regions of northern Eurasia photochemical system. This work was supported by the Russian Scientific Fund under grant 14-47-00049 and by the Russian Foundation for Basic Research under grants 13-05-41395, 14-05-31071.



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**Ozone and nitric oxides in the Surface Air over Russia: background conditions and extreme cases**

*Natalia PANKRATOVA, N. F. ELANSKY, A. I. SKOROKHOD (Russian Federation)*

The results of the 1995–2012 observations of the concentrations of ozone and nitric oxides in the surface air over the Trans Siberian Railway using a mobile laboratory (the TROICA experiments) are analyzed. The features of the spatial distribution and time variability of these gases over the continent within the latitudinal belt 48°–58° N are revealed individually for polluted and background conditions. The characteristic features of their distribution are a decrease in the concentration of nitric oxides and an increase in the concentration of ozone in an eastward direction. On the whole, the process of photochemical ozone formation over the territory of Siberia is slow. Noticeable increases in the concentration of ozone are associated with both forest and steppe fires and with the transboundary transport of pollution from the countries of eastern Asia. The dry precipitation of trace gases plays a significantly larger role in Siberia than in coastal and highaltitude unpolluted regions due to powerful and long temperature inversions. The comparison of TROICA data and ZOTTO data was also made. It was shown that there are no clear background conditions near the Trans Siberian Railway. In general ozone concentration is lower then on ZOTTO, NOx concentration is higher then on ZOTTO. Anyway ZOTTO and TROICA data need in more detail investigation for definition of background condition. This work was supported by the Russian Scientific Fund under grants 14-47-00049, 14-05-31078, 14-05-31071.



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# Numerical study of water-atmosphere gas exchange parameterization for a boreal lake

*Sofya GUSEVA, V.M. STEPANENKO (Russian Federation)*

Lakes are an important source of atmospheric methane and carbon dioxide, as is evidenced by numerous field measurements. Thus, it is necessary to gain a comprehensive understanding of physical and biochemical mechanisms responsible for lake methane emissions, that would facilitate prediction of these fluxes in future climate. As the main research tool we use the lake numerical model LAKE (Stepanenko et al., 2011). One of the most important parts of this model is a parameterization of gas exchange at the air-water interface, which governs the magnitude of methane diffusive flux. The most incertain element of this parameterization is the gas transfer velocity, k, that is determined by a complex of insufficienly understood physical processes. These processes characterize a state of the atmospheric surface layer above the water and the top thin layer of the lake. In current study, we implement three parameterizations of transfer velocity in the LAKE model: empirical relationship of k with wind speed (Cole J. and Caraco F., 1998), film stagnant model (Whitman, 1923), and the surface renewal model (Higbie, 1935). The LAKE model is then applied to the lake Seida (Republic of Komi), and its output is compared to measurement data, performed by University of Eastern Finland. Further, we carry out an analysis of differences between the model results using the three gas exchange parameterizations.



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# The stationary avalanche research observations on the Elbrus Educational and Scientific Station of the Faculty of Geography, Moscow State University

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The Moscow State University (MSU) Elbrus station is located on the northern slope of the Central Caucasus at the foot of Mount Elbrus (2326m). A stationary research conducted since 1967 resulted in a unique database of avalanches and snow cover, as well as the large-scale maps of avalanche danger, determination of the regularities of the properties of snow cover, identification of the quantitative criteria of different genetic types of avalanches, and proposed protection measures against avalanches. Over the past two decades research has also revealed the regularities of the mountainous glacio-nival systems' reaction to the impact of a rapidly changing climate. A particularly close attention was given to the snowfall and avalanche activity which are directly affected by the air temperature fluctuations. For an assessment of avalanche danger in winter times, a methodical approach was developed based on the key avalanche-forming factors. While defining types of winters, parameters were used similar to those as in the computational climate modelling, i.e. air temperature and precipitations, ratio of which defines the different types of snowiness. Whilst defining the types of winters, an important role is given to the seasonal extremes, which are considered as the closest analogs of either a colder or warmer climate as in comparison to the modern climate. Such an approach allows broadening the existing ideas about the links between climate and avalanche activity, and creates a new way to solving the urgent problem of forecasting avalanches and reconstructing the risks associated with avalanche activity Currently the Elbrus station is one of the few stationary bases in the Caucasus where the avalanche research is carried out following the single method 45 years aiming at solving problems of avalanche danger to the population and holidaymakers.



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## Aspects of Future High Speed Ground Transport – are Maglev Systems a Promising Option?

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High speed ground transport requires a wide-ranging and interdisciplinary discussion. Arguments of comfort advantages (compared to aeroplane or bus) or regional development strategies (reurbanisation, metropolis formation, urban networks, global cities etc.) must be taken into account, if high speed transportation systems are to find acceptance with the general public and politics. Therefore, a possible innovation of Maglev (magnetic levitation) systems is a question that all in all should be discussed mainly on macroeconomic and long term transport policy criteria. Japan has made such a decision and invests into a 50 billion Euro high speed Maglev between Tokyo and Osaka - thus switching from steel/wheel rail to Maglev to modernize its transportation infrastructure backbone. Is Maglev a relevant option for Russia, too? Should the renewal or construction of new high-speed corridors be based on the new system of Maglev technology like in Japan, China or Germany (Transrapid)? Or would that be a mistake? To find an answer, the current business model of high speed ground transport needs to be analysed and evaluated. The findings should then be compared with Maglev technology. The presentation will focus on lessons learned in other countries, and identify key issues that need to be adressed in order to strengthen an intercity transport network. Aspects of perspectives and limitations will be discussed in principle. An outlook over potential future perspectives and international trends will be given.



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# The improving of urban basic public service system based on rural migrant family demands: The key links of citizenization of peasant workers

*Chen HONGSHENG, Wang XINGPING (China)*

Accelerating the progress of peasant workers's citizenization is the crucial task of China's urban development. Equalizing basic public service is the significant strategic measures to complete the task. This paper systematically analyzes the logical relation between citizenization and household and equalization of basic public service, and this article put forward the idea that household urbanization is the advanced stage of citizenization.This article classifies public service into three groups according to the demand of rural migrant families, including life service, development service and institution service. According to the location of rural migrant family members and the difference of public service demand, the rural migrant family demand of public service could be divided into 6 stages. The public services of first three stages are provided by rural area, while the rest are provided by urban area. Based on the context, this paper suggests that it is necessary to establish the "region-province-city" public service providing system and the allocation standard of public service should be revised by "permanent household". Afer more than three decads of reform and opening up, the economic growth will slow down gradually which lead to a new development era of China, named "new normalcy". During this period, China will pay more attention to social benefit and social equity. As such, researchs concerning social effect of public service are expected to spring up.



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## Anti-Growth Machine-Indemnity Housing Projects of Guangzhou

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Since the late of 1980s, with the development of real estate marketization, Chinese urban growth machine was formed by coalition of the local urban government, developers, builders, etc. This model benefits for local government and developer, but sacrifices the public interests, especially low income interests and make housing unaffordable. Since 2010s, an anti-growth machine was gradually emerged as a model in China. This paper review the development of anti-growth machine in china, and examine Indemnity Housing Projects of Guangzhou and the development of Anti-Growth Machine in Guangzhou, we generalize three kinds of Guangzhou indemnity housing projects: enterprise independent construction model, enterprise-government coalition model, and government leading-enterprise model. The policy implication is that the government may turn its role in growth machine of the real estate, from gains to pay, for establishing a harmony society.



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# South Georgia Island (Antarctic) in Postglacial Time

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Island' (Insular) Territories, particularly their coastal zones, have highly sensitive environment. Therefore, the information on the current status and forecast development of the corresponding sea coasts is an important component of the estimation of the Islands'surroundings organization and conditions of its function. On the example of the northern sea coast of South Georgia Island the features of neotectonics of the coastal zone and the direction of its postglacial development at high latitudes were demonstrated. The Island is undergo by differential tectonic uplift. Data on the structure and morpholithodynamics of the northern coasts of the Island made it possible to make conclusion that in the Holocene the sea level in the Antarctic does not exceed its present position, which had been achieved no later than 1000 B.P. during the raising after regression in the time previous global glaciation. Neotectonics of investigated area is characterized by block structure due to faults of NE (dominant) and NW strike. Coastal development in the late Holocene and now goes by regression scenario, and will follow it with the leading role of vertical neotectonic movements. Such islands, which accentuate of the microcontinental blocks, are favorable polygons, where the trends and rates of change of the Holocene and modern sea level can be studied with high confidence. The conducted studies go beyond the regional level, and will help in solution of number of problems of global natural science. They are harmony with the program ANTEC SCAR (1999), Barbados Program (BAP-1994), Marine Doctrine of the Russian Federation (RF) - 2001 and the Program «World Ocean» (2010) of the RF apply to activity strategy in the Antarctic. This work was supported by RFBR (grant № 13-05-00589) and RSF (grant № 14- 17-00547)



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# A Geospatial Analysis of Multi-scalar Regional Inequality in China

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The study of regional inequality has attracted numerous attentions of geographers and economists. The interdisciplinary research has been reflected in a spatial-temporal hierarchical structure, that is, the multi-scalar nature of economic convergence and the temporal dynamics of geographical inequality. With the support of big databases, the integration of these two growing fields provides opportunities for a spatially integrated social science. Therefore, this study aims to explore this long-debated issue from two novel perspectives. On the one hand, the newly available county-level dataset will be employed to reexamine the three major issues of economic inequality and then a comparative analysis at the county level, city level and provincial level will be conducted to study the scale nature of economic inequality. On the other hand, the spatial data exploratory analysis as well as the geospatial analysis provides a new methodological framework to study the spatial effects of economic development. Three major research issues have been reexamined at three different spatial scales using the geospatial analysis: the temporal trend of multi-scalar inequality, spatial dynamics of development and metropolitan areas and the mechanisms of inequality.



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# Teaching Environmental Values and Responsible Behavior through Geography Education: problems &opportunities

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In the past two decades in Iran like many other regions of the world environmental crisis that affect seriously on human life has strongly increased. Some parts of these environmental problems caused by the lack of environmental norms, ethics and protection culture always escalated. Among the curriculums, geography has the greatest potential for conducting the values and creating environmental responsible behavior. Values drive the decisions we make. Also every curriculum including geography seeks to achieve influence on learners as it can make change their identities and beliefs and penetrate to their spirits and minds. This paper intends to investigate different aspects of effective environmental education considering the problems and possibilities. This paper used the research results analyzing the content of 60 official textbooks of geography in secondary level, 30 local geography textbooks that taught in 30 provinces of Iran, and the questionnaire responses from 300 geography teachers. The results show, in total, geography curriculum does not operate as expected in terms of the important current environmental issues of Iran, engaging students with problems and effective education of values and attitudes .Although all of teachers believe that changes in environmental education can conduct the culture of community and cope with negative effects of environmental destruction, for various reasons, however, geography curriculum has stalled (stopped) from environmental changes. Thus, adoption of strategies in this area is necessary and urgent. Key words: Iran's geography curriculum, Geography education, Environment education, Environmental values and attitudes



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# Regional Identity as a factor of sustainability and socio-economic development on the periphery of Central Russia

*Mikhail KRYLOV (Russian Federation)*

Some Russian experts consider the periphery areas of Central European Russia are just ruined and are not able for modern self-development. Their argument is based on the high level of poverty residents these regions. Experts do not take into account that the current level of wealth is just one of the factors of development. Among the other important factors in the development in the first place should be mentioned cultural factors including the Identity. As is known from the history, Identity often determines the success of the development of nations and regions in the long and medium term. We interpret the Regional Identity as ability and will to live and to develop the territory (including both the local and regional levels). The Identity of local communities as a whole determined by long-term local specific features is indifferent to the level of the region's social-economic development at the current moment. The author's research enables to ascertain the normal development of Regional Identity in the periphery of the Center of Russia. Depressive from an economic point of view, peripheral areas show the necessary features of modern healthy society on the criterion of Identity. In most peripheral regions the resistance to the idea of joining the richer and more prosperous neighboring territories was discovered. There is a relation to the inhabitants of the neighboring regions as friendly neighbors. In most peripheral regions we observed growth of the local patriotism by increasing the level of education. The locals "by birth" and "by conviction" make up 80% of respondents. We found that a sharp increase in public support for local "green movements" occurs just in the middle - developed periphery cities where the development of social and cultural potential is medium.



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