INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SCIENCE AND TECHNOLOGY

PROCEEDINGS

2017

INTERNATIONAL CONFERENCE ON

ENVIRONMENTAL SCIENCE AND TECHNOLOGY

PROCEEDINGS

▪ ORGANIZER

INSTITUTE OF GEOGRAPHY AND GEOECOLOGY, MAS

MONGOLIAN ACADEMY OF SCIENCES

▪ CO-ORGANIZER

MINISTRY OF EDUCATION, CULTURE, SCIENCE AND SPORT

MINISTRY OF ENVIRONMENT AND TOURISM

PARLIAMENTARY STANDING COMMITTEE ON SOCIAL POLICY, EDUCATION, CULTURE AND SCIENCE

MONGOLIAN NATIONAL CHAMBER OF COMMERCE AND INDUSTRY

UN-REDD PROGRAMME

NATIONAL UNIVERSITY OF MONGOLIA

MONGOLIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

MONGOLIAN NATIONAL UNIVERSITY OF EDUCATION

MONGOLIAN STATE UNIVERSITY OF AGRICULTURE

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CONCEPT NOTE

Introduction of the EST 2017

Today, there are a number of negative consequences arising in many countries from world climate change and anthropogenic impacts including health problems, various challenges arising from local environmental changes, and changes, particularly shortages, in water resources. Scientific research studies have proved the negative impact of climate change on permafrost and glaciers, changes in ecosystem range, variation in annual average precipitation, intensive desertification, and the loss of rangeland. The first International Conference on Environmental Science and Technology (EST2017) aims to provide the opportunity to discuss and debate how to overcome these negative impacts using the latest scientific approaches and technology. While this inceptive international conference marks the present institute's historic anniversaries, it is anticipated that future Environmental Science and Technology conferences will be organized biannually in the future.

The main objective of this international conference is to formulate integrated recommendations and promote open discussion and common understanding of environmental issues by gathering various stakeholders including scientists and policy makers in a broad range of environmental science, social and economic sectors.

The EST2017 conference will be attended by scientists and researchers from China, including Inner Mongolia, Russia, including Buryat, Germany, Japan, Korea, Canada, and Mongolia including leaders and representatives from government organizations, research institutes, and universities.

WELCOME MESSAGE

On behalf of the Institute of Geography-Geoecology, MAS and myself, I sincerely welcome all distinguished scholars and honorable guests participating in this International Conference on Environmental Science and Technology (EST2017) to honor and celebrate the 90th anniversary of the establishment of modern geographical science sector in Mongolia and the 55th anniversary of the establishment of the former Institute of Geography & Permafrost, MAS and the 20th anniversary of the former Institute of Geoecology, MAS.

Globally, in the 21st century, there have been fundamental changes in human society and population growth. Therefore, this new era must see a science-based society and a knowledge based economy. Nations in the 21st century have created new economic approaches and provided sustainable economic development based on knowledge, by creating and selling knowledge products and creating eco-friendly products. This is a change from older commodity-based economic activities.

In the future, Mongolia has to become a country with a green knowledge economy and a high technological capacity that can produce eco-friendly, quality goods and advanced scientific and technological products, instead of being a predominantly mining based economy. First, our greatest wealth is our ecology and our natural environment. Second, a country with such a low population cannot produce products that require heavy labor capacity. For this reason, we predict that Mongolia must start producing “brain-power” products, and we are directing our research and study works towards this sphere.

In the new century, a new paradigm has been formed for humanity. We must manage science and technological achievement, create fresh progressive technology, harmonize human consumption with the world’s biosphere and become accustomed to it. This concept is formulated as sustainable development by scientists and this is a green based knowledge economy and a green development concept.

The 1st EST2017 conference is open to everyone interested in environmental issues and technology. Through discussions and meetings with government, academia, and scientists from different countries, the 1st EST2017 will allow collaborative works and strengthen our ties with each other.

I am firmly convinced that our active participation in the 1st EST2017 will contribute to strengthening the field of environmental science and its sustainable development.

Let knowledge flourish forever from generation to generation!

Sincerely,

Dr. BATTOGTOKH, D.

Director of the Institute of Geography and Geoecology,
Mongolian Academy of Sciences

CONGRATULATORY MESSAGE

On behalf of the Parliament, and its affiliated social policy, education, culture and science committee, I am here to welcome the many generations of scientists here today to the 90th anniversary of the development of modern Geographical science in the Institute of Scripture, the first Center of Science in Mongolia, the 55th anniversary of the Institute of Geography and Permafrost, and the 20th anniversary of the establishment of the Institute of Geoecology.

The institute has been a leader in advancing historical goals such as adaptation to climate change, efficient use of natural resources, reducing the negative impacts of human activities, minimizing negative impacts of mining, decentralization of population, maintaining a healthy and ecologically balanced living environment, introducing world-class knowledge and technology to Mongolia and the development of international cooperation in science and technology.

The parliament and its respective committees have been working with research institutions and scientists in the fields of environmental studies, sociology and economics to improve the legal and regulatory organization of these sectors, as well as working closely with policy and development program administrators in support of sector development, and will continue to work together with these organizations in the future. We are proud to welcome all academic staff members to this historical anniversary. We wish you success in your future research work, and happy anniversary.

SANJMYATAV, Ya.

Vice chair of the State Great Hural (Parliament) of Mongolia)
Member of the Parliamentary Standing Committee on
Social Policy, Education, Culture and Science

CONGRATULATORY MESSAGE

It has been over 90 years since the first Mongolian geography department was established in 1926 as a component of the Institute of Scripture, which was itself founded in 1921- the first ever modern scientific institute in Mongolia.

At present a total of 1720 researchers are now working in our institutions, including 10 institutions founded by the Academy of Sciences, 14 institutions under university organization and 5 non-governmental funded institutions. All of our academic institutions focus their efforts on improving laboratory conditions, and creating innovative solutions for a wealth of knowledge. They are also important to improve the "Government-Science-Private Sector" partnership that is the foundation of innovative development.

Since the 1920s Russian scientists, such as A.D. Simukov and E.M. Murzaev have contributed significantly to the development of modern geographical sciences in Mongolia. The "Physical Geography of Mongolia"- state prize winner and the first "Green map" of Mongolia have been among the most important achievements.

The Institute of Geography and Geoecology, Mongolian Academy of Sciences plays a major role in the establishment of a scientific groundwork to study Mongolia's natural resources and their conservation, as well as the development of the fields of geography and geoecology in our country.

The Institute has a wide range of research and development projects in forest, soil, permafrost, lake research, water utilization, geographic information systems, remote sensing, physical geography, economic geography and land use, and it produces the Mongolian National Atlas and the Desertification Atlas.

The Institute's contribution to Geography and Geoecological education in primary and secondary schools and universities in Mongolia is also very significant.

It is my wish that you continue to explore the natural resources of Mongolia and achieve success in your geographical and geoecological research efforts, and I hope that your contribution to the prosperity of Mongolia will continue to grow.

Happy 90th anniversary for the development of modern geographical sciences in the Institute of Scripture and Mongolia's first scientific institute, the 55th anniversary of the Institute of Geography and Permafrost, and the 20th anniversary of the establishment of the Institute of Geoecology.

TSOGZOLMAA, Ts.

Member of the State Great Hural (Parliament) of Mongolia
Minister for Education, Culture, Science and Sport of Mongolia

CONGRATULATORY MESSAGE

On the behalf of the Mongolian Academy of Sciences and myself, I would like to congratulate all staff, researchers and administrators of the Institute of Geography and Geoecology on their coincident anniversaries, including the 90th anniversary of the first specialized, modern geographic science organization in Mongolia, the 55th anniversary of the Institute of Geography and the 20th anniversary of the Institute of Geoecology, and to wish them all the best and continued success!

I should mention that the Geographical Department was established at the Institute of Literature and Scripts in 1924, and this establishment laid the groundwork for modern environmental science in Mongolia.

Between 1926 and 1937, this department, led by Andrey Dmitriyevich Simukov, conducted surveys on Mongolian geographical features, such as relief, river networks, flora, fauna, climatic conditions, herder migrations and livestock husbandry development.

The establishment of the Academy of Sciences of the People's Republic of Mongolia in 1961 enabled wider research, and better surveying of the Mongolian environment. The Institute of Geography and Permafrost Study was founded at the Academy of Sciences in 1962 by merging the Geography Department and the Permafrost Study Department of the Natural Sciences Institute as well as the Geological Group. The institute made significant contributions to the development of Mongolian geographic sciences and became a pioneering scientific research center.

The merger of the Institute of Geography and the Institute of Geoecology of the Mongolian Academy of Sciences under Government Resolution Ref No.27, 2015 enabled Mongolian scientists to carry out more extensive and multilateral surveys of the Mongolian environment and Mongolian society.

This year, we are celebrating the 90th anniversary of the Geography Department of the Institute of Scripture, the 55th anniversary of the Institute of Geography and the 20 th anniversary of the Institute of Geoecology at the Mongolian Academy of Sciences. By virtue of hard work and the best efforts of researchers and scientists from all generations, scientific treasures are becoming richer and the level and quality of surveys and research works are increasing year-to-year. The high-quality level of work on new and innovative methods, technolog ies, and theor ies shows that the competency of your personnel has increased, internal and foreign relationships have been reinforced, and research works can be developed to the highest international standards.

You are respectfully and responsibly embracing the goal of evolving your institute into a regional leader, and an organization that makes a real contribution to the development of Mongolia.

Have a wonderful academic journey!

Yours cordially,

Academician REGDEL, D.

President of Mongolian Academy of Sciences

CONGRATULATORY MESSAGE

On behalf of the Ministry of Environment and Tourism, I would like to express my greetings to the scientists and researchers of different generations for the 55th anniversary of establishment of the Institute of Geography, one of oldest institutes at the Mongolian Academy of Sciences, and the 20th anniversary of establishment of the Institute of Geoecology.

I would like to express my special greetings to famous senior scientists as famous geographer, academician Sh.Tsegmid, state honored scientist N.Lonjid, lake researcher, state honored scientist J.Tserensodnom, cultural enlightenment, famous researcher O.Namnandorj, state honored scientist D.Bazargur, state honored scientist, leading member of Mongolian Academy of Sciences, academician D.Dorjgotov, state honored worker in water sector J.Lkhakhuu, state honored scientist in environment Ts.Baldandorj, L.Myagmar, they all had been and are key persons in terms of environmental research in Mongolia.

The Institute of Geography and Geoecology of the Mongolian Academy of Sciences shall carry out scientific baseline studies on environmental protection, ecological balance, conservation of natural resources, rational use and restoration of Mongolia in accordance with the sustainable development concepts and green development trends, drafting policies and procedures, developing conclusions and recommendations on critical ecological issues in the country and adjacent regions, norms and standards and support the implementation of the process, as well as your research findings are used as a base for Mongolian policy documents.

I hope from the bottom of my heart that your research efforts will be develop in successful and the knowledge and further research results of scientists and researchers of the Institute of Geography and Geoecology will play an important role for the protection of the Mongolian nature, the rehabilitation of degraded land, and the implementation of rational management.

Finally, I would like to wish you all the best of luck and every success of discovery, and implementation of your research. Conclusions of scientific theory and practice are a cornerstone of the development of Mongolia.

TSENGEL, Ts.

State secretary,
Ministry of Environmental and Tourism, Mongolia

DETAILED PROGRAM

Date: 27 October, 2017
Venue: Mongolian National Chamber of Commerce and Industry

Time	Activities
08:00-09:00	**Registration**
Plenary Event	
Timeframe: 09:00-11:30	
Room: Main Hall	
09:00-09:30	**Opening Ceremony** ▪ **Welcome speech** Dr. Battogtokh, D. Director of Institute of Geography and Geoecology, MAS ▪ **Congratulatory Remark** Mr. Sanjmyatav, Ya. Vice chair of the State Great Hural (Parliament) of Mongolia Member of the Parliamentary Standing Committee on Social Policy, Education, Culture and Science ▪ **Congratulatory Remark** Ms. Tsogzolmaa, Ts. Member of the State Great Hural (Parliament) of Mongolia Minister for Education, Culture, Science and Sport, Mongolia ▪ **Congratulatory Remark** Academician Regdel, D. President of Mongolian Academy of Sciences (MAS) ▪ **Congratulatory Remark** Mr. Stefan Duppel Ambassador of the Federal Republic of Germany ▪ **Congratulatory Remark** Mr. Tsengel, Ts. State Secretary of Ministry of Environment and Tourism, Mongolia
09:30-10:00	**Keynote presentations** ▪ **90 Years of Mongolian Geographic Study** (History of the former institute of Geography, Mongolian Academy of Sciences) Academician Dorjgotov, D. General advisor, Institute of Geography and Geoecology, MAS ▪ **20 Years of Mongolian Geoecological Study** (History of the former institute of Geoecology, Mongolian Academy of Sciences) Dr. Tsogtbaatar, J. Principal investigator, Institute of Geography and Geoecology, MAS
10:00-10:30	**Signing ceremony of the Memorandum of Understanding**
10:30-11:00	**Awarding Ceremony**

11:00-11:10	**Group Photo**
11:10-11:25	**Coffee break**
SESSION 1: ENVIRONMENTAL RESEARCH TREND AND CHALLENGES	
Timeframe: 11:30-18:00	
Room: Main Hall	
Sub-session: Environmental Policy and Sustainability	
Chairman: Academician **Amarsaikhan, D**. Head, Division of Remote Sensing and Spatial Modelling, Institute of Geography and Geoecology, MAS Dr. **Dong Suocheng**, Leading professor, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences	
11:30-11:45	**Specific Features and Legal Background of the Environmental State Report** Dr. Nyamdavaa, G. General Director, Department of Environment and Natural Resources Administration, Ministry of Environment and Tourism, Mongolia
11:45-12:00	**Sustainable Land Management as a Holistic Approach to Achieve Long-term Productive Ecosystems** Prof. Atsushi Tsunekawa Professor, Arid Land Research Center, Tottori University, Japan
12:00-12:15	**Environmental Science-Policy Interface: Globally and Mongolia** Prof. Chuluun, T. Director, Institute of Sustainable Development, National University of Mongolia
12:15-12:30	**The Baikal region: protection of Lake Baikal and socioeconomic development of the territory** Dr. Igor N.Vladimirov Director, V.B.Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences
12:30-12:40	Questions and Discussion
12:40-13:40	Lunch
Sub-session: Ecology and Environmental Management	
Chairman: Prof. **Chuluun, T**. Director, Institute of Sustainable Development, National University of Mongolia Prof. **Yoshihiro Iijima**, Associate Professor, Mie University, Japan	
13:40-13:55	**Ecological Regional Assessment and Ecosystem Management in Mongolia** Sc.D. Oyungerel, B. Principal investigator, Institute of Geography and Geoecology, Mongolian Academy of Sciences

13:55-14:10	**Current State, Dynamics and Use of Water Resources in the Cross-border Altai Mountain Region** Dr. Margarita Syromyatina Research Fellow, Institute of Earth Sciences, Saint-Petersburg State University, Institute of Earth Sciences, Russia
14:10-14:25	**REDD+ Strategies for Addressing Climate Change Mitigation and Adaptation** Mr. Khishigjargal, B. Programme manager, UN-REDD Mongolian National Programme
14:25-14:40	**Multiple Scaled Observations of Boundary Permafrost Over Mongolia** Dr. Mamoru Ishikawa Associate Professor, Hokkaido University, Japan
14:40-14:45	Questions and Discussions
Sub-Session: Natural Resources and Utilization	
Chairman: Dr. Prof. **Baatarbileg, N.** Director of the School of Engineering and Applied Sciences, National University of Mongolia Dr. Prof. **Atushi Tsunekawa**, Professor, Arid Land Research Center, Tottori University, Japan	
14:45-15:00	**Land-Water-Food Nexus in North China Plain** Prof. Yonghui Yang Vice Director, Center for Agricultural Resources Research, Institute of Genetics & Developmental Biology, Chinese Academy of Sciences
15:00-15:15	**Principles of sharing the water resources of the transboundary Selenga river** Dr. Garmaev Endon Zhamyanovich Director, The Baikal Institute of Nature Management, Siberian Branch of Russian Academy of Sciences
15:15-15:30	**Innovations for Re-Greening Mongolian Gobi** Mr. Odsuren, Ch. Branch manager, Mongolian-Korean Green Belt Project
15:30-15:45	**Rainfall Partitioning by Xerophytic Shrubs and the Significance of Stemflow to Soil Water and Nutrient Enrichment** Dr. Yafeng Zhang Assistant professor, Shapotou Desert Research and Experiment Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
15:45-15:50	Questions and Discussions
15:50-16:00	Coffee break

Sub-session: Environmental Process and Modelling	
Chairman: Dr. **Mamoru Ishikawa**, Associate Professor, Hokkaido University, Japan Dr. **Dashtseren, A**. Head of the Division of Permafrost study, Institute of Geography and Geoecology, Mongolian Academy of Sciences	
16:00-16:15	**Erosion-Accumulative Processes and Protection of Land Resources in the South of Eastern Siberia** Dr. Ryzhov Yury Victorovich Director, Irkutsk Scientific Center, Siberian Branch of Russian Academy of Sciences
16:15-16:30	**Modelling and Mapping of Arid Land Mountain Permafrost In Mongolia** Dr. Jambaljav, A. Senior scientist, Division of Permafrost study, Institute of Geography and Geoecology, Mongolian Academy of Sciences
16:30-16:45	**Observed Asymmetric Warming on the Qinghai-Tibetan and Mongolian Plateau from 1961 to 2013** Dr. Tonghua Wu Professor, State Key Laboratory of Cryospheric Sciences, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
16:45-17:00	**Inter Annual Variations in Water Cycle and Frozen Ground Interaction in Mongolian Forest-Steppe Boundary** Prof. Yoshihiro Iijima Associate Professor, Mie University, Japan
17:00-17:05	Questions and Discussions
Sub-session: Climate Change and Environmental Impact	
Chairman: Dr. **Igor N. Vladimorov**, Director of V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences Dr. **Battulga, P**. Scientific secretary, Institute of Geography and Geoecology, Mongolian Academy of Sciences	
17:05-17:20	**Deforestation and Degradation Trends in Mongolia: Development of a Forest Emission Reference Level** Dr. Khongor, Ts. National Concultant, UN-REDD Mongolian National Programme
17:20-17:35	**The Impact of Climate Change in Mongolia** Dr. Gomboluudev, P. Head, Climate change and Resources research division, Information and Research Institute of Meteorology, Hydrology and Environment, Mongolia

17:35-17:50	**Seasonal variation of net N mineralization under different biological soil crusts in Tengger Desert, North China** Dr. Rui Hu Assistant professor, Shapotou Desert Research and Experiment Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
17:50-17:55	Questions and Discussions
SESSION 2: ENVIRONMENTAL INNOVATION AND TECHNOLOGY	
Timeframe: 11:30-18:00	
Room: Conference room # 507	
Sub-session: Remediation and Control Technologies	
Chairman: Prof. **Wang Tao**, Director, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences Prof. **Myagmartseren, P**. Head of the Department of Geography, National University of Mongolia	
11:30-11:45	**Collaboration Project to Combat Desertification in Mongolia** Dr. Ho Duck Kang Professor, Dongguk University, Korea
11:45-12:00	**Pursuit Sustainable Desertification Reversion in Horqin Sandy Land, Inner Mongolia** Dr. Xueyong Zhao Executive director, Department of Agro-ecology, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
12:00-12:15	**Restoration Practices on Degraded Lands of Mongolia** Dr. Khaulenbek, A. Head, Division of Desertification study, Institute of Geography and Geoecology, Mongolian Academy of Sciences
12:15-12:30	**Aeolian Desertification in China** Prof. Wang Tao Director, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
12:30-12:40	Questions and Discussion
12:40-13:40	Lunch
Sub-session: Environmental Education and Ecotoxicology	
Chairman: Dr. **Xueyong Zhao**, Executive director of Department of Agro-ecology, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences Dr. **Tsogbadral, Kh**. Head of the Department of Geography, Mongolian National University of Education.	

13:40-13:55	**Free Tools for Knowledge Management** Ms. Linda Mahoney Coordinator, MERIT project in Mongolia, Canada
13:55-14:10	**Applications of Modern Remote Sensing Technologies for Environmental Studies in Mongolia** Acad. Amarsaikhan, D. Head, Division of Remote Sensing and Spatial Modelling, Institute of Geography and Geoecology, Mongolian Academy of Sciences, Mongolian Academy of Sciences
14:10-14:25	**The Soil Pollution Problems of Ulaanbaatar City Area** Dr. Batkhishig, O. Head, Division of Soil Science, Institute of Geography and Geoecology, Mongolian Academy of Sciences
14:25-14:40	**Study carbon sequestration capacity of wetland in the Yellow river basin-Taking Yinchuan plain as an example** Mr. Bu Xiao Yao Ningxia Polytechnic University, China
14:40-14:45	Questions and Discussions
Sub-session: Environment and Economic Development	
Chairman: Dr. **Altanbagana, M**. Head of the Division of Social-Economic Geography, Institute of Geography and Geoecology, Mongolian Academy of Sciences Dr. **Delgerjargal, D.** Senior lecturer, School of Agroecology, Mongolian State University of Agriculture	
14:45-15:00	**Study on Conditions and Layout of Trans-border High-Speed Railway of Russia, Mongolia and China** Dr. Dong Suocheng Leading Professor, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
15:00-15:15	**Regional Economic Take on Sustainable Development of Mongolia** Mr. Erdenebayar, D. Head, Sector's Development and Policy regulation division, National Development Agency, Mongolia
15:15-15:30	**Railway Passage Development and Security Strategy of the South Silk Road Economic Belt** Prof. Dong Xiaofeng Professor, Beijing Jiaotong University, China
15:30-15:45	**Digital Baikal** Dr. Alexander Kononov Deputy Director, Institute of Earth's Crust, Siberian Branch of Russian Academy of Sciences
15:45-15:50	Questions and Discussions
15:50-16:00	Coffee break

Sub-session: Waste Management and Water Technology	
Chairman: Dr. Prof. **Daniel Karthe,** GMIT German Mongolian Institute for Technology Dr. **Odontsetseg, D**. Head, Division of Water Resource & Water Utilization, Institute of Geography and Geoecology, Mongolian Academy of Sciences	
16:00-16:15	**Hydrological study for Chlorinated Drinking Water** Dr. Amarsanaa, B. Head, Laboratory of Ecological Chemistry, Institute of Chemistry and Chemical Technology , Mongolian Academy of Sciences
16:15-16:30	**The Results of the Application of Electrotomography for the Detection of Polluted Groundwater Flows in the Urez Zone of the Listvyanka Settlement** Dr. Minaev Aleksandr Viktorovich Head of the Innovation Department, Limnological Institute, Siberian Branch of Russian Academy of Sciences
16:30-16:45	**Evaluation of Managed Aquifer Recharge Methods for Semi-Arid Sub-Arctic Region** Mr. Nasanbayar, N. Lecturer, Environmental Engineering Department, School of Civil Engineering and Architecture, Mongolian University of Science and Technology
16:45-17:00	**Water protection zone of Lake Baikal on the basis of the landscape-hydrological approach** Dr. Olga V. Gagarinova Head, Hydrology and Climatology Department, V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences
17:00-17:05	Questions and Discussions
Sub-session: Ecological Stability	
Chairman: Dr. **Alexander Kononov**, Deputy Director, Institute of Earth's Crust, Siberian Branch of Russian Academy of Sciences Dr. **Nyamdavaa, B.** Senior Scientist, Division of Soil Science, Institute of Geography and Geoecology, Mongolian Academy of Sciences	
17:05-17:20	**Effects of paleo-climate development and Climate Change indicated by lakes and glaciers in Western Mongolia** Dr. Michael Walther Senior advisor, Institute of Geography and Geoecology, MAS
17:20-17:35	**Environmental aspects of urbanized territories in the Baikal region** Dr. Andrey A. Sorokovoy Acting Deputy Director, V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences

17:35-17:50	**Research framework and mechanism of ecological effects of tourism in developing areas** Ms. Xia Bing Doctor Candidate, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
17:50-17:55	Questions and Discussions
Closing Ceremony	
Timeframe: 18:00-18:20	
Room: Main Hall	
18:00-18:10	**EST2017 Recommendation** Acad. Amarsaikhan, D. Head, Division of Remote Sensing and Spatial Modelling, Institute of Geography and Geoecology, Mongolian Academy of Sciences, Mongolian Academy of Sciences
18:10-18:20	**Closing Remarks** Dr. Battogtokh, D. Director, Institute of Geography and Geoecology, Mongolian Academy of Sciences
19:00-22:00	Welcome Reception

EST 2017

KEYNOTE PRESENTATION

90 Years of Mongolian Geographic Study

Acad. Dorjgotov, D.
General advisor

Institute of Geography and Geoecology, Mongolian Academy of Sciences

geo-dgv@magicnet.mn

The 90th anniversary of the development of geographic science in Mongolia is occurring this year. The history of Mongolian geography research can be divided into four periods.

First period (1926-1945). Russian specialist Simukov. A.D worked from 1927 until 1939 as head of the Geography cabinet within the Institute of Literature and Scripts (Mongolia's first science organization), given that there were no Mongolian specialists in geography. His research was in cartography, natural conditions, pasture, livestock industry, herder migration, economics and the geographic definition of an Aimag- this was the genesis of geographic research in Mongolia. Beginning in 1940, Murzaev. E.M, a physical geography specialist, Bespalov. N.D, a soil scientist, Bannikov. A.G, a zoologist, and Shubin. W.F, an agronomist, worked here and helped lay the foundations for scientific research.

Second period (1962-1961). In this period the first Mongolian scientists Badamjav D, Sandagdorj G, Tsegmid Sh, and Gungaadash B contributed to the development of physical geography, economic geography and cartographic research in Mongolia. They trained geography specialists and instructors in the geography departments of the University of Mongolian Teachers in 1951, and the National University of Mongolia in 1965.

Third period (1962-1991). In this period the Institute of Geography and Permafrost within the Mongolian Academy of Sciences was established to research physical geography, landscapes, socio-economic geography, soil science, permafrost science, lake science and cartography. Researchers at this institute produced numerous papers and books. Also at this time 17 researchers earned Ph.Ds and three researchers earned Sc.Ds. There were some organizations in Mongolia that researched and studied geography besides the Institute of Geography and Permafrost MAS, for instance, the National University of Mongolia, the Mongolian Education University, the Mongolian University of Life Science and research institutes of the ministries. About 40 individuals earned Ph.Ds in geographical science from these organizations, and helped influence the development of Mongolian geographic sciences.

Fourth period (1992-2017). Since the democratic revolution of 1990 Mongolia has been transformed into a free-market society. In this time international cooperation in the geographic sciences has grown. Cooperating with universities and institutes in Russia, Germany, Japan, USA, Canada, China and Korea, this has been an important step in the development of geographic science in our country. It is necessary to note that the direction of science has changed to emphasize research in ecology. This is intrinsically

related to the issues of environment evolution, environmental resources and safety, long term monitoring, regional development and social issues. During this time, 40 researchers from Institute of Geography became Ph.Ds., and four scientists became Sc.Ds. About 60 individuals earned Ph.Ds. and 5 Sc.Ds. from other institutes and universities. Knowledge and capacity of the geographic sciences in Mongolia has reached its highest level yet. There are now many research books and papers. Some of the most significant are the “Mongolian National Atlas”, 2009, which includes 256 thematic maps, the “Ecological Atlas of the Baikal Lake Basin”, 2015, which includes 142 thematic maps, and the “Mongolian National Encyclopedia” volumes I, II, III, 2009.

We aim now to prepare for the next generation that is building on the work of the previous generations, those who have laid the groundwork for Mongolian geographic and environmental science.

20 Years of Mongolian Geoecological Study

Dr. Tsogtbaatar, J.
Leading researcher

Institute of Geography and Geoecology, Mongolian Academy of Sciences

tsogtbaatar2014@gmail.com

Today we are celebrating the accomplishments of the previous years and anticipate the future leadership of Institute of Geography and Geoecology in the interdisciplinary endeavors of ecology, environmental science and the related science disciplines.

The Institute of Geoecology was a unique institution that brings integration of different research fields in land management, water resource management and forestry and silviculture. The institute includes departments that are dedicated and dynamic in their work and mission. In the past decades, from ecological point of view, restoration ecology has been an important research field of research projects of the institute. Restoration and rehabilitation of disturbances and degradation of ecosystem in natural zones of the country brings science application to the practice through research design, mapping and field demonstration, piloting with the tangible results and achievements in the field.

This moment is not only an occasion to look back, but also an opportunity to look ahead. At this moment, I have been privileged that Institute of Geoecology, a place where young scientists engage in the interdisciplinary study of water resource management, land management, forestry, silviculture and social sciences and the related sciences.

For past two decades, the institute has been engaged in a vibrant partnership with scientists from different fields with academic excellence as core values. Taking this opportunity, I would like to note that we have embraced the visionary ideals and values of the Institute's founders and collaborators.

I am fortunate to embrace the passion of everyone who is involved with the Institute of Geoecology and I am especially pleased to offer my congratulations and best wishes in this anniversary year.

Once again I express my very best wishes for continued success at the Institute of Geography and Geoecology.

EST 2017

SESSION 1:

ENVIRONMENTAL RESEARCH TREND AND CHALLENGES

EST 2017

Sub-Session:

Environmental Policy and Sustainability

Sub-Session Description

At present, our planet is witnessing the global environmental changes caused by natural influences and human activities. Increased level of greenhouse gases is warming the planet, main renewable resources such as forest and water are being degraded, animals are changing migration patterns and plants are changing the dates of activity, and extensive mining and exploration of finite resources such as fossil fuels are having widespread negative impacts on fragile natural systems. In order to keep the planet for our next generations, we should clearly understand these impacts, develop appropriate planning and related polies, and elaborate world-wide solutions that can sustainably manage various human interactions with natural systems.

Considering the above issues, four reports have been highlighted. The first report examines the legal background for writing a report on environmental state and conditions as well as some natural resources and environmental problems of Mongolia, while the second report reviews Sustainable land management and effective and efficient approaches to to achieve long-term productive ecosystems. The third report describes some examples of green development pathways for Mongolia and overview of renewal energy driven meat freezing system for pastoral systems, whereas the last report highlights the protection of the Baikal Lake and socioeconomic development of the region.

Chairs

Academician Amarsaikhan, D.

- Division head, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Dr. Dong Suocheng

- Leading professor, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Speeches

- **Specific Features and Legal Background of the Environmental State Report**

  Prof. Nyamdavaa, G.

  General Director, Department of Environment and Natural Resources Administration, Ministry of Environment and Tourism

- **Sustainable Land Management as a holistic approach to achieve long-term productive ecosystems**

  Dr. Atsushi Tsunekawa

  Professor, Arid Land Research Center, Tottori University

- **Environmental Science-Policy Interface: Globally and Mongolia**

  Dr. Chuluun, T.

  Director, Institute of Sustainable Development, National University of Mongolia

- **The Baikal region: Protection of Lake Baikal and socioeconomic development of the territory**

  Dr. Igor N. Vladimirov

  Director, V.B. Sochava Institute of Geography Siberian Branch Russian Academy of Sciences

Specific features and legal background of the Environmental State Report

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Study of the environmental state plays particularly important role for ensuring conditions of the stable development of the country, development of any policies and programs to determine the nature state that can have any exert on nature due to one or another activity, and also to rationally establish an optimal volume of such activities.

Every two years, it is prepared a consolidated report on the environmental state, changes that have taken place, the reasons and related measures that are discussed at the at the government level and the Great State Hural (Parliament) of Mongolia, which is used as grounds to be taken into account to develop the national and government policy. It is specified in item 2.7, clause 47 of the Parliamentary Session Procedure Law of Mongolia. When developing the report we follow the statute “The approval of methodology to develop the report” that was approved by decree number 330 of the Environment Minister from 2007 year.

While writing this article the spokesman has used for a basis the experiences and materials of research works carried out in Mongolia under his leadership for a period of 2013-2014 and 2015-2016 years. The first part of this article examines the legal environment for writing the report on the natural environment state and the historical processes. In addition, in this scientific article a certain attention is focused on the climate of Mongolia, land issues, surface and ground water, forest, plants, animals, soil, air condition, environment pollution and main features of degradation.

Sustainable Land Management as a holistic approach to achieve long-term productive ecosystems

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At the United Nations Sustainable Development Summit on 25 September 2015, more than 150 world leaders adopted the new 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs). With respect to dryland development, the SDG target 15.3 states: “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”. Sustainable Land Management (SLM) plays an essential role in achieving a land degradation-neutral world. SLM was defined as “the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions”. This definition, originating from the United Nations Earth Summit in 1992, presents SLM as a holistic approach to achieving long-term productive ecosystems by integrating biophysical, sociocultural and economic needs and values. By exploring traditional knowledge and reevaluating indigenous technologies which have been refined over many generations in the region, or developing new appropriate technologies, a variety of SLM technologies are now available. However, we have noticed that there are still challenges in the current SLM to be solved. First, to prevent land degradation and restore degraded land, the soil and water conservation measures should be improved further. Second, effective and efficient SLM approaches, which are defined as the ways and means used to promote and implement SLM technologies and to support them in achieving widespread SLM, should be established. Third, SLM projects should be linked with socio-economic empowerment of local people, to improve their livelihood and assist the socially vulnerable. By innovating SLM through development of eco-friendly and profitable technologies, we must achieve a land degradation-neutral world.

Environmental Science-Policy Interface: Globally and Mongolia

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Economic growth is an engine for development. However, there are two key issues from sustainability point of view that need to be addressed; that of the equal distribution of wealth among populations within countries, and whether economic growth itself can be green. In order to address these issues, I am proposing a new sustainable development index is proposed which integrates the economic (composite of GDP per capita and income inequality), environmental (CO_2 per capita) and social (expected longevity at birth) dimensions. A new Sustainable Development Index completely shifts development targets into social and environmental resilience building, addressing challenges such as climate change and societal equality. It brings new insights into governance for sustainability because better societal equality and green development pathways depend on policy decisions made by the government and institutions.

A Green Development Policy of Mongolia adopted by the Parliament of Mongolia in 2014. The Green Development Policy has 6 strategic objectives with measurable goals up 2030. It was developed as a framework of sustainable development goals, specific for Mongolia. In addition to economic, social and environmental dimensions of sustainability, cultural and political dimensions were included to capture better local national context for development. The Green Development Policy of Mongolia supports the global commitment to change current unsustainable development trends, and transition to a socially inclusive, low greenhouse gas and reduced waste development model, by changing and conserving natural resources and ecosystem value, along with increasing human well-being and reducing poverty. Recognizing the need for a change in current socio-economic development trends and patterns, the Green Development concept transitions Mongolia to a development model that ensures the improved well-being and prosperity of Mongolian citizens by safeguarding the sustainability of ecosystem services, increasing the effective consumption of natural resources and ensuring economic growth that is inclusive and environmentally sound.

Finally, some prime examples of green development pathways for Mongolia such as conservation of natural, cultural and historic heritages (proposing the Globally Important Agricultural Heritage System in the western economic region), and introduction of renewal energy driven meat freezing system for pastoral systems were introduced.

The Baikal region: Protection of Lake Baikal and socioeconomic development of the territory

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The Baikal region possesses huge reserves of various natural resources and their industrial development is continuously increasing, causing complex environmental problems. Low potential of Geosystem stability to anthropogenic disturbances in this region create a large number of environmental restrictions related to environmental quality and environmental safety of the population, preserving the biological diversity of territories, and sustainable ecological and economic development.

For the Baikal region, a certain environmental policy has been formed regarding the protection of Lake Baikal. Numerous decrees have legislatively introduced a new regional form of nature management a special regime for the use of natural resources within the basin of Lake Baikal. A special regime for economic and other activities for the Baikal region should be implemented on the basis of the following principles:

- priority of activities that do not lead to a violation of the unique ecological system of Lake Baikal;
- accounting for the complexity of economic activity impact;
- balanced decision making of socio-economic tasks and objectives of protecting the ecosystem of Lake Baikal.

All this stimulates the search for new scientific and applied approaches in the ecologization of nature management, taking into account the features of its natural landscape complexes and their components.

The main goal of environmental management at the present time is creation of conditions for harmonious, balanced development of nature, society and economy. Recognizing the priority for society of the life-supporting functions of geosystems before direct use of its resources should be specially emphasized, regarding meeting the balance of the population's needs for welfare and environmental well-being.

In these conditions, the environmental optimization of environmental management based on the ecological potential of geosystems is the main paradigm of environmental policy in the Baikal region, which will allow to take into account the balance of environmental and economic interests of society.

EST 2017

Sub-Session:

Ecology and Environmental Management

Session Description

This sub-session on ecology and environmental management covers topics such as conservation, forest management and permafrost studies in Mongolia and river basin research in the northwestern China. The Government of Mongolia has a goal to protect 30 of natural habitat. For this purpose, ecological regional assessment of Mongolia defined priority conservation areas (Dr. B.Oyungerel). Strategies for addressing climate change mitigation and adaptation for forests in Mongolia will be introduced by B. Khishigjargal. Permafrost study at more than 80 deep (>10m) boreholes, covering continuous, discontinuous, sporadic and isolated permafrost zones provided some evidences of permafrost degradation since 1960s according to Dr. Mamoru Ishikawa and his colleagues. River basins are the most valuable ecosystems in drylands. Calculation by Dr. Wenzhi Zhao suggests that the oasis in middle the Heihe river basin at the current water use patterns is at a quasi-stable state, and almost approaching the threshold of instability.

Chairs

Prof. Chuluun, T.
- Director, Institute of Sustainable Development, National University of Mongolia

Prof. Yoshihiro Iijima
- Associate Professor, Mie University, Japan

Speeches

- **Ecological Regional Assessment and Ecosystem Management in Mongolia**
  Sc.D. Oyungerel, B.
  Principal investigator, Institute of Geography and Geoecology, Mongolian Academy of Sciences
- **Current State, Dynamics and Use of Water Resources in the Cross-border Altai Mountain Region**
  Dr. Margarita Syromyatina
  Research Fellow, Institute of Earth Sciences, Saint-Petersburg State University, Institute of Earth Sciences, Russia
- **REDD+ Strategies for Addressing Climate Change Mitigation and Adaptation**
  Khishigjargal, B.
  Programme manager, UN-REDD Mongolian National Programme
- **Multiple Scaled Observations of Boundary Permafrost Over Mongolia**
  Dr. Mamoru Ishikawa
  Associate Professor, Hokkaido University, Japan

Ecological regional assessment and ecosystem management in Mongolia

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The method of ecological regional assessment has widely used to develop a landscape conservation plan such as a systematic natural conservation planning and protection of biodiversity. The approach of ecological regional assessment is a method make to a systematic analysis current state of diversity of marine, freshwater, terrestrial ecosystem and to planning conservation based on scientific.

The ecological zone is a representation of large ecosystem that differs in environmental conditions such as landform, climate, hydrology, soil, plant and animal that is an even concept as the same as a natural region of our country. Ecoregion assessment that is systematic conservation planning designed for identifying a set of the places or areas that, represent the majority of native species habitats, natural communities and ecological systems found within a planning area.

The internationally recognized in ecological region assessment practice in order to protect area to make representative assessment at ecosystem and landscape level then conservation plans have also set coarse filter goals as 30% of historic areal extent, based loosely on the species-area relationships derived from studies of island biogeography and “Habitat islands”.

In 2008, Ministry of Nature, Environment and Tourism, Administration of Land Affairs, Geodesy and Cartography and Mongolian Academy of Sciences have implemented a study on “Ecological regional assessment of Mongolia” supported by an International organization “The Nature Conservancy”. The result that the goal set by the Mongolia government to protect 30% of natural habitat.

By the result of ecological regional assessment defined priority conservation areas there are consist of 37 sites covering 371000 км^2 of the Mongolia steppe, 50 sites covering 195000 км^2 southern Gobi ecological region, 90 sites covering 148000 км^2 Khangay-Khovsgol ecological region, 60 sites covering 129000 км^2 Mongol-Altay, Depression of Great lake and Lakes valley ecological region, respectively.

Current State, Dynamics and Use of Water Resources in the Cross-border Altai Mountain Region

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The results of several projects funded by Russian geographical society and RFBR are represented. One of the key sites is Tavan Bogd mountain massif and surrounding territory located on the border of Mongolia, Russia and China, the watershed between the Arctic Ocean basin and Inner Asia closed drainage area and a large modern glaciation center. Eastern slope glaciers are concerned with formation of the main river of western Mongolia, Khovd River. Glacier area on the northern slopes is much less, but partly concerned with formation of upper Ob river basin. Complex geographical in situ measurements were conducted during last several years in the upper Khovd-river basin and Ukok plateau regions, including hydrological, hydrochemical, glaciological, dendrochronological and civil interrogation. Statistical analysis was made using hydro-meteorological station data; remote sensing data acquired from satellites were used.

There is positive mean annual air temperature trend (0.4-0.6°C/10ys) in the region during the last several decades. Non-significant positive annual precipitation trend was revealed. So for example in the Khovd river basin the rise of temperature plays a critical role and we see a tendency to aridization that also influence on hydrological regime. These facts are well confirmed by dendrochronological streamflow and temperature reconstructions for a longer period. Glacier area and tongue regression was fixed also mainly under temperature influence. Total glacier area decreased approximately by 4.5 % in Tsagaan-Gol basin and by 6.9 % in Tsagaan-Us basin from 1989 to 2013. Large glaciers such as Kozlov and Potanin were retreating at an average rate of 28-34 m/year between 2001 and 2014. There are some non-synchronous changes of glacier retreat rate with the northern slope glaciers associated basically with morphological and geomorphological patterns. Hydrochemical analysis showed that the water type is changing from hydrocarbonate-calcium to sulfate-calcium, TDS from 0-1 to 67-93 ppm from headwaters along the river.

REDD+ Strategies for Addressing Climate Change Mitigation and Adaptation

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As a party to the United Nations Framework Convention on Climate Change (UNFCCC), Mongolia has made significant efforts to formulate and implement national policies and measures to mitigate its greenhouse gas emissions and prepare for adaptation to some of the expected impacts of climate change. REDD+ is a climate change mitigation mechanism under the UNFCCC, whereby developing countries can receive results-based payments for reducing greenhouse gas emissions from the forest sector, on the basis of internationally agreed rules for implementation and standardized methodologies for measuring, reporting and verifying those emissions reduction performances. Mongolia's REDD+ strategy is being developed and aims to focus on meeting Green Development and Sustainable Development Visions of the country, and in undertaking policies and measures aimed at both mitigation, adaptation and meeting sustainable development goals. According to Mongolia's INDC, the country is committed to reduce its greenhouse gas emissions by 14% by 2030, compared to projected emissions under a business as usual scenario. The melting of permafrost and glaciers, surface water shortages, and soil and pasture degradation have been identified as particular challenges faced by Mongolia as a result of climate change. Due to a high degree of vulnerability to climate change, adaptation is particularly important for Mongolia, and as such a distinct adaptation component is therefore included in the country' INDC. Although no emissions reduction targets from Land use, land use change and forestry sector was accounted in the total emissions reduction target set by INDC, the country aims to increase its forest area up to 9%, reduce forest fire affected area by 30%, reduce forest degradation, and to implements re-forestation and sustainable forest management strategies. If carbon sinks of natural ecosystems absorb almost two thirds of CO2 emissions from other sectors in the country, a well designed national REDD+ strategy could make a significant contribution to sectoral strategies designed to support the country's mitigation and adaptation goals and objectives, including for water, energy, tourism, mining and agricultural sectors. Therefore, REDD+ provides a useful means of action that can help in addressing climate change mitigation and adaptation issue in land use, land use change and forest sector.

Multiple-scaled observations of boundary permafrost over Mongolia

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Mongolia is the only one country where permafrost directly sustains the livelihoods of inhabitants. Permafrost distribution is mosaic-like and considerably overlapped with fundamentals of ecosystem services. Toward comprehensive understanding of such heterogeneous dynamics, we have established multi-scaled observations, areal coverages of which are from point to country-wide. We introduce scientific achievements resulted from these observations.

Point measurements at Nalaikh and Udleg stations are to quantify one-dimensional fluxes of energy, water and CO_2. We identified importance of nonconductive heats to warm and cool dry active layer. At the Udleg site seasonality of CO_2 and energy fluxes above Larch forest over warm permafrost were documented. By basin scaled observations at Terelj, we illustrated clear contrast in hydro-thermal characteristics of soil between permafrost and immediately adjacent permafrost-free slopes. Furthermore comparable energy balance measurements indicated thermal properties of the organic-rich soil and shading by forest cover as primary determinants of permafrost preservation.

In order to generalize abovementioned knowledge, country-wide network for permafrost monitoring was established. The network includes more than 80 deep (>10m) boreholes, covering continuous, discontinuous, sporadic and isolated permafrost zones. It provided some evidences of permafrost degradation since 1960s. The network also proved that thermal parameters of permafrost (mean annual ground temperature, depth of annual amplitude, active layer thickness) are statistically correlated with permafrost zones, climate and land cover types. These findings are now under application for making innovative maps showing the states of permafrost.

The thermal states of permafrost largely varies in space, corresponding to a series of consecutive stages of permafrost degradation. Long-term (more than decades) monitoring of permafrost and land-surface ecosystem need for inclusive observational researches under the collaboration among myriad of stakeholders and scientists. In this context fostering Mongolian young researchers is one of the most crucial issues.

EST 2017

Sub-Session:

Natural Resources and Utilization

Session Description

The sub-session will discuss presentations on the restoration of drylands, greening efforts and concepts of joint responsibility for the transboundary rivers and water resources. For instance, the presentation from China will demonstrate science and technology progress made over the last decade to restore dryland in the northwest of the country to expand the sustainable development idea in this unique region by introducing the progressive technology on sand fixation which allows the expansion of productive lands. The ecological issues to conserve ecosystems along the Selenge river is one of the priorities for both Mongolia and Russia, due to Selenge river is the source of Baikal lake, the World heritage. The rational use of water resources, the implication of sound environmental land use technologies and promote sustainability of the basin region is an essential discussion point, which will be highlighted during this sub-session. The presentation about greening the drylands is a main focus of the sub-session. The sub-session will discuss such emerging topics like tree water use, rational treatment of trees and shrubs, and water efficient regimes.

Chairs

Dr. Prof. Baatarbileg, N.

- Director of the School of Engineering and Applied Sciences, NUM

Prof. Atushi Tsunekawa

- Professor, Arid Land Research Center, Tottori University, Japan

Speeches

- **Land-Water-Food Nexus in North China Plain**
  Prof. Yonghui Yang
  Vice Director, Center for Agricultural Resources Research, Institute of Genetics & Developmental Biology, Chinese Academy of Sciences
- **Principles of sharing the water resources of the transboundary Selenga river**
  Dr. Garmaev Endon Zhamyanovich
  Director, the Baikal Institute of Nature Management, Siberian Branch of Russian Academy of Sciences
- **Innovations for Re-Greening Mongolian Gobi**
  Mr. Odsuren, Ch.
  Branch manager, Mongolian-Korean Green Belt Project
- **Rainfall Partitioning by Xerophytic Shrubs and the Significance of Stemflow to Soil Water and Nutrient Enrichment**
  Dr. Yafeng Zhang
  Assistant professor, Shapotou Desert Research and Experiment Station, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences

Land-Water-Food Nexus in North China Plain

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Agriculture, the largest consumer of water, is increasingly causing global water shortage and degradation of natural ecosystems in arid and semi-arid regions. Although application of water saving technology can substantially decrease water use in each piece of land, continuous expansion of irrigation land and irrigation intensity resulted in a much worse water resources shortage. Similarly, North China plain (NCP), one of three critical productive areas for China's food supply, is facing the serious water shortage in both surface water and groundwater supply. Thus, cutting-down the cultivation of water-consuming crops, wheat or maize, become the most effective choice of decreasing water use. However, irrational crop regulation could damage either the local food supply or the national food security. Sustaining regional water balance and food security is a challenge not only for China but also world-wide. To meet the double required tasks, chord diagrams, a visualizing tool was adopted to more clearly show the self-consumption and outflow or ingress and egress of water through food exportation and importation from a region. By taking two staple crops, wheat and maize, in Beijing-Tianjin-Hebei in North China as an example, water consumption by the two crops are modeled through crop model (DSSAT), while food importation and exportation in each region was investigated and evaluated from family level food balance. Then, our method demonstrated that the ingress and egress of food and virtual water by Chord diagrams to distinguish how much water and food are consumed locally and to show how crop plantation changes gives no harm on local people's food supply. The adopted Chord diagrams are efficient in illustrating the connection between regional water sustainability and local food security and provide meaningful tool in policy making for regional crop regulation.

Principles of sharing the water resources of the transboundary Selenga river

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Currently, in the territory of Mongolia (where 2/3 of the catchment area of the Selenga River is located), preparatory work for construction of hydroelectric stations on a number of tributaries of the River Selenga and in the mainstream of the watercourse is underway. it is commonly known that river Selenga is the main Baikal tributary, the water flow of which largely determines the general inflow of water resources into the lake. As a consequence, the level regime of the lake Baikal, which today has certain problems due to the low-water cycle in the region, as well as the entire ecosystem of the world's largest fresh water body (for the record, the Baikal has been a UNESCO World Heritage Site since 1997), directly depend on the formation of water resources in the basin of the river Selenga on both sides of the state border. Therefore, the problem of ecologically safe and economically efficient use of water resources of the transboundary river Selenga is extremely relevant. Moreover, the prospects for economic and social development of large regions of neighboring countries largely depend on the success of its solution. In these conditions, having a long history of good-neighborly relations between our states give grounds for counting on a successful solution of the problem of joint use and protection of the water resources of the river Selenga, thereby ensure the well-being of the receiving water body - Lake. Baikal.

In our opinion, the contribution of hydrologists to the solution of the problem under consideration can include the following elements.

1. The detailed formulation of the requirements of hydroecological safety (HES), i.e. determination of the set of permissible hydrological parameters values of lake Baikal and its tributaries, where conditions for sustainable economic and social development of the entire catchment area are reliably ensured, and also for the preservation of natural ecosystems.
2. Creation of a unified system for hydrological monitoring of the Baikal Basin, which allows to assess the current state of all major water bodies and predict possible changes in the parameters of their hydrological regime under the influence of various natural and anthropogenic factors for a sufficiently long period.
3. Development of recommendations on the rational use and protection of water resources in the Lake Baikal Basin and of the scientific basis for resolving conflict situations between water users under different scenarios of likely climate change and possible options and the scale of economic development.

Innovations for Re-Greening Mongolian Gobi

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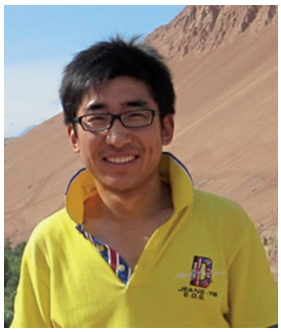
In order to reduce desertification and land degradation in Mongolia and minimize emissions of yellow dust storms, the Mongolian-Korean Green Belt project started to implement since 2007, according to the agreement of two countries government. This project have implemented for 10 years and this year is the end of project. We have experimented the solutions such as a technology for agro-reforestation development at the top of wind of a large urban settlement in territory of Dalanzadgad soum of Umnugovi province and a technology for green belt construction to protect large central roads in territory of Lun soum of Tuv province which are chosen by us to implement the project. There are currently the green belt of 500 hectares of land in each territory. Also, we have founded a tree nursery for restoration of saxaul forest in Bayanzag which is located in Bulgan soum of Umnugovi province and currently, 1500 hectares of land has been reforested for agro-reforestation development.

We will present the potential difficulties to introduce agro-reforestation technologies in desert areas of Mongolia's Gobi and steppe zones and the successful implementation of technological solutions by this report. Including:

- Experiments and practical activities to choose the species of trees and shrubs,
- Solutions of the dual irrigation options for green belt construction,
- Finally, the opportunity to develop the agro-reforestation solutions in a perfect sense are included.

Rainfall partitioning by xerophytic shrubs and the significance of stemflow to soil water and nutrient enrichment



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Revegetation experiments have been established for more than 60 years at Shapotou area in the southeastern fringe of the Tengger Desert, northwestern China, using mainly xerophytic shrubs such as Caragana korshinskii and Artemisia ordosica, which is considered as a successful model for desertification control and ecological restoration. The former sand dune landscape has been greatly transformed into a landscape characterized by a mosaic of the sparse shrubs and herbs and the bare interspaces. Since rainfall is the sole source of water replenishment of this area, the availability of water and nutrients for vegetation growth and survival is critical to the development of this rain-fed revegetated desert ecosystem with an annual mean precipitation below 200 mm. Vegetation canopy, by redistributing incident precipitation into interception, throughfall and stemflow, affects the hydrological and biogeochemical fluxes between vegetation and soil. In our study, stemflow and throughfall were monitored for C. korshinskii and A. ordosica during 4 growing seasons. We quantified the percentages of stemflow, throughfall and interception loss for two shrubs, and determined the threshold values of precipitation for stemflow generation. We evaluated the effects of shrubs' stemflow on soil water and nutrient enrichment at shrub basal area using funneling ratio and enrichment ratio, and upscaled the nutrient flux of rainfall partitioning from individual plant to the vegetation community. Through quantitative analysis, we concluded that stemflow is an important localized source of soil water and nutrients that can be channeled into the deeper soil layers to favor the growth and survival of shrubs. There probably exists a synergistic effect of rainwater accumulation and nutrient enrichment on the stemflow-influenced areas, which is beneficial for the adaptability and stability of shrub communities and plays a significant positive role in the development of this rain-fed revegetated desert ecosystem of study area.

EST 2017

Sub-Session:

Environmental Process and Modelling

Session Description

The main focuses of the section are scientific results from environmental process and modelling studies, which cover large area from the South of Eastern Siberia to the Qinghai-Tibetan Plateau. These studies indicate that the economic development of forest-steppe and steppe landscapes of southern East Siberia has led to increased rates of erosion-accumulative processes and reduce crop yields, reduction of soil humus horizons and area of arable lands. As result of the new permafrost map of Mongolia, it is divided to into five zones such as continuous, discontinuous, sporadic, isolated and zone of seasonally frozen ground, and permafrost underlies about 29.3% of total area of Mongolian territory. Also, it is well-known that permafrost in Mongolia is not only warming but also thawing due climate warming. The magnitudes of warming trend on the Qinghai-Tibetan Plateau and Mongolian Plateau are similar for annual air temperature and freezing/thawing index. While the characteristics of seasonal warming are different in those two regions. As mentioned above, the permafrost in Mongolia has been degrading under the climate change, however, results from the last study in this session show that permafrost and forest in mountain slope has an important role in sustaining water resource in Mongolia.

Chairs

Dr. **Mamoru Ishikawa**

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Dr. Dashtseren, A.

- Division Head, Division of Permafrost study, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Speeches

- **Erosion-Accumulative Processes and Protection of Land Resources in the South of Eastern Siberia**
  Dr.Ryzhov Yury Victorovich
  Director, Irkutsk Scientific Center, Siberian Branch of Russian Academy of Sciences
- **Modelling and Mapping of Arid Land Mountain Permafrost In Mongolia**
  Dr. Jambaljav, A.
  Senior scientist, Division of Permafrost, Institute of Geography and Geoecology, Mongolian Academy of Sciences
- **Observed Asymmetric Warming on the Qinghai-Tibetan and Mongolian Plateau from 1961 to 2013**
  Dr.Tonghua Wu
  Research Fellow, State Key Laboratory of Cryospheric Sciences, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
- **Inter Annual Variations in Water Cycle and Frozen Ground Interaction in Mongolian Forest-Steppe Boundary**
  Prof. Yoshihiro Iijima
  Associate Professor, Mie University, Japan

Erosion-Accumulative Processes and Protection of Land Resources in the South of Eastern Siberia

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Erosion-channel system is self-regulatory, provides formation, transit and accumulation of sediment as a result of erosion-accumulative processes. The main components of the balance include the basin (soil and gully erosion, other exogenous processes) and channel processes. Intensive economic development of forest-steppe and steppe landscapes of southern East Siberia has led to increased rates of erosion-accumulative processes and the sediment load in small rivers catchments.

The main consequences of accelerated erosion and deposition on the catchments of small rivers in the following: growth of eroded land areas; increases of gully network density; accumulation in river channels, degradation and reduction of the river network; activity of the mudflows and debris flows; increase of water discharge and sediment yields, formation of river channel bars.

The potential volume of soil erosion from arable lands in the South of Eastern Siberia is estimated at 73.3 million t/y. Annual removal of sediment from gullies is 27.3 million tons, total the sediment yields - 21.0 million t/y. In the forest-steppe and steppe landscapes of the southern regions of Eastern Siberia there are processes of desertification.

Soil and gully erosion reduce crop yields, reduction of soil humus horizons and area of arable lands. Therefore, state policy in soil conservation and erosion control program are imperative. The program should include agricultural and agroforestry activity in soil protection from erosion and deflation, increase of soil fertility.

Modelling and Mapping of Arid Land Mountain Permafrost In Mongolia

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Mongolia is located in the transition zone between the world largest permafrost area of Siberia and the Mongolian Gobi. North of the country has permafrost and there is not a permafrost in the south. Thus, the mapping of permafrost is a challenge for scientists working in this field. We have some maps of permafrost on a national and local scales. Due to limited data sources, southern limits of permafrost were drawn differently. The most famous is geocryology map with a scale of 1: 1,500,000. This is called as the Gravis map, which was generated in 1971. According to Gravis map, the general regularities of permafrost distribution are determined by latitudinal and altitudinal zonality of changes in climatic and topographic factors. Mongolia is divided into five permafrost zones, as continuous, discontinuous, islands, scattered islands and sporadic. New map of permafrost distribution was generated based on the TTOP (temperature on top of permafrost) modelling approach as follow.

As results of this TTOP model, the permafrost occupies one third of country area and we have divided the country area into five zones based on modelled temperature at top of permafrost, such as continuous, discontinuous, sporadic, isolated, and zone of seasonally frozen ground. Continuous permafrost zones with temperature less than -2°C concentrate at high elevation areas, in center of vast depressions, and in far north of country. Discontinuous (with temperature between -1°C and -2°C), sporadic (with temperature between -1°C and 0°C) and isolated (with temperature between 0°C and 1°C) permafrost zones belt the continuous permafrost zones.

Permafrost underlies about 462.8*103 km^2 or about 29.3% of total area of Mongolia including glaciers and lakes. Of this total area, continuous permafrost underlies 118.3*103 km^2 or about 7.5%, discontinuous permafrost underlies about 127.7*103 km^2 or about 8.1%, sporadic permafrost underlies about 112.4*103 km^2 or about 7.1%, isolated permafrost underlies about 104.4*103 km^2 or about 6.6% of total area of Mongolia respectively.

Observed Asymmetric Warming on the Qinghai-Tibetan and Mongolian Plateau from 1961 to 2013

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The majority of the QTP and the MP are underlain by permafrost and seasonally frozen ground. We have examined trends in air temperature and freezing/thawing index for the Qinghai-Tibetan Plateau (QTP) and the Mongolian Plateau (MP) during the last 53 years. The non-parametric statistical analysis results reveal a clear picture of climatic warming in both regions. Generally the magnitudes of warming trend on the QTP and MP are similar for annual air temperature and freezing/thawing index. While the characteristics of seasonal warming are different in those two regions. The warming of QTP is mainly due to winter warming, which is consistent with the conclusions previous studies drawn. While the warming of MP is primarily caused by autumn warming, characterized by a slightly winter cooling trend during the last two decades. The different features of seasonal warming on both plateaus would be expected to result in diverse impacts on the ground thermal regime.

Inter Annual Variations in Water Cycle and Frozen Ground Interaction in Mongolian Forest-Steppe Boundary

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In northern Mongolia, south–north gradients in moisture and temperature regimes are closely related to the geographical distribution of vegetation. Vegetation type varies from semi-arid steppe to boreal forest along a south-north gradient. The ecosystem boundary in this region is characterized as an aspect–dependent vegetation pattern of forest on north–facing slopes and grassland on south–facing slopes.

The objective of the present study is, thus, to clarify the seasonal and interannual variations in eco–hydrological characteristics at the forest and grassland slopes in the typical watershed in northern Mongolian mountain based on the continuous field observation. Eco-hydrological response in relation to phenological difference at both slopes contrasted by differences in frozen soil and snow conditions are also examined.

Our observation in the larch forest of north-facing slope in Shiljree river watershed, upper part of Tuul River near Terelj in Khentei Mountains, revealed that active layer develops within the depth of 2.8 m in north-facing forest slope. In addition to ground temperature and soil moisture observation, sap flow (transpiration) of larch trees, meteorological elements and river runoff measurement were carried out to estimate total water balance in this watershed. The estimation of water balance during summer 2006 demonstrated that the larch forest slope suppressed the evapotranspiration with half of amounts in grassland slope. It means that precipitation and soil water in forest slope can be partitioned to evapotranspiration and river runoff. On the other hand, grassland at south-facing slope has remarkably large amounts of evapotranspiration and therefore both precipitation and soil water was consumed entirely to evapotranspiration. The results strongly imply that the coexistence between permafrost and forest in mountain slope has an important role in sustaining water resource.

EST 2017

Sub-Session:

Climate Change and Environmental Impact

Session Description

Sub-session on climate change and environmental impacts has considered deforestation, degradation, greenhouse gas emission and future projection of climate change in Mongolia, and research result on net N cycling and transformation case study of China in arid desert area.
First report describes to develop forest reference emissions levels and forest level and national monitoring system and safeguards information system through United Nations Collaborative Initiative for reducing emissions from Deforestation and forest Degradation.
Second report has done the modeling future 80 years climate change projections by 20 years intervals through monthly based temperature and precipitation outputs from multi-model ensemble of the 8 climate models. The result shows that drought frequency will be increased in west and south western parts, winter harshness will be expanded in some north part and eastern part of the country in Mongolia.
Third report describes soil net N mineralization and nitrification significantly different depended on seasonal patterns in 3 microhabitats and N transformation rate significantly affected seasonal climate variation. In winter time, inorganic N content was higher in the moss-covered soil than in other soils. During the early growing season soil net N transformation rate was increased in biological soil crust, while the inorganic N content was reduced in plant growing season.

Chairs

Dr. Igor N. Vladimorov

- Director, V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences

Dr. Battulga, P.

- Scientific secretary, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Speeches

- **Deforestation and Degradation Trends in Mongolia: Development of a Forest Emission Reference Level**
  Dr. Khongor, Ts.
  National Concultant on FRL/NFMS, UN-REDD Mongolian National Programme
- **The Impact of Climate Change in Mongolia**
  Dr. Gomboluudev, P.
  Head, Climate change and Resources research division, Information and Research Institute of Meteorology, Hydrology and Environment, Mongolia
- **Seasonal variation of net N mineralization under different biological soil crusts in Tengger Desert, North China**
  Dr. Rui Hu
  Assistant professor, Shapotou Desert Research and Experiment Station,
  Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences

Deforestation and Degradation Trends in Mongolia: Development of a Forest Emission Reference Level

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A Forest Reference Emission Levels and Forest Reference Levels (FREL/FRL) is one of the four elements when preparing to implement REDD+. Forest Reference Emission Levels and Forest Reference Levels (FREL/FREL) are benchmarks for assessing the performance of each country in implementing REDD+. Results of REDD+ implementation are measured against the FREL/FRL and in the context of Results-based payments (RBPs) should be reported against the FREL/FRL.

We applied the Openforis - Collect Earth a tool for measurement of forest cover and its change as part of the countries vision to improve monitoring of greenhouse gas emissions land cover changes and to support National REDD+ programme (Strategy, FRL and NFMS). Collect Earth utilizes Google earth and Bing map's high resolution imageries and the entire Landsat image archive available through Google Earth Engine.

We objectively assessed over 123,000 sample points which cover whole territory of the Mongolia on land use and forest changes between year 2000-2015 for the period of 15 years. The result showed that 199,492 ha forest land changed to grassland, 2,531 ha forest lands changed to settlement and 8,607 ha grassland changed to forest land. 3283213 ha area affected by fire, pest, wind and snow damages. Forest land related emission and removal of the CO2 is calculated as 180,293 thousand tonnes. Forest degradation related emission accounts 169,877 thousand tonnes deforestation related emission accounts 10,255 thousand tonnes and afforestation related removal was 161 thousand tonnes.

Climate hazard projection over Mongolia based on CMIP5 Multi-Model Ensemble

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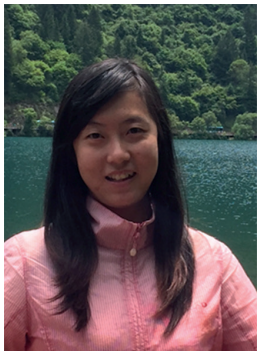
The impact of climate change on drought, winter harshness and winter hazard events (dzud) was assessed over the Mongolia. This was done through monthly based temperature and precipitation outputs from multi-model ensemble of the 8 climate models of Coupled Model Intercomparison Project Phase 5 (CMIP5). Standardized values of monthly temperature and precipitation in summer and winter season, and their seasonal difference were used as indicators. Changes of them were identified by temporal evolution and frequency in early (2016-2035), middle (2046-2065) and late 2081-2100 respect to 1986-2005 baseline climate. Future climate projection under moderate and high-emission scenarios showed that drought will be more frequent, while winter harshness will be weakening, and consequently winter hazard event will increase more dependent on drought severity. Relative high severity of those is projected in the west and southwestern part for drought, in some part of north and east for winter harshness and in northern part of the country under high emission scenarios late 21st century.

Seasonal variation of net N mineralization under different biological soil crusts in Tengger Desert, North China



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Biological soil crust (BSC) is a key biotic factor in desert areas and can significantly alter nutrient cycling. The interaction between seasonal climatic change and BSC can further modify nutrient cycling. Thus far, limited information has been provided regarding the effect of BSC on net soil nitrogen (N) transformation and their seasonal pattern in temperate desert areas. Therefore, we assessed the seasonal patterns of net soil N mineralization and nitrification in three microhabitats (moss-covered, cyanobacteria–lichen-covered, and bare soils) from October 2011 to September 2012 by using an intact soil core in situ incubation method. Seasonal variations in inorganic N pools, net N mineralization, and nitrification rates were observed. The seasonal patterns of net N transformation rates were greatly modified by soil temperature and moisture (highest in August and lowest in January). During non-growing season, net N immobilization was observed in the three microsites; a higher inorganic N content was observed in the moss-covered soil than in other soils. BSC increased the net soil N transformation rates during the early growing season but reduced the inorganic N content during the peak growing season. On the basis of these findings, we concluded that seasonal variation in climate significantly affected N transformation. The colonization and the development of BSC stimulated N cycling and storage in arid desert systems.

EST 2017

SESSION 2:

ENVIRONMENTAL INNOVATION AND TECHNOLOGY

EST 2017

Sub-Session:

Remediation and Control Technologies

Session Description

The panel is open to presenters to discuss the future of dryland and its conservation. During the past Mongolia made some effort to assess, monitor and restore degraded drylands, so the majority of presentations to be discussed during the session will show the cons and pros of the past research, lessons learned and the possible ways to move forward. The aeolian desertification is a major obstacle in dryland development, thus the invited presenters from China will introduce their progress towards tackling aeolian desertification and the ways to upscale their knowledge and technology along the Road and Belt Initiative. The specific focus will be given to the future of Mongolian dryland ecosystems, especially promotion of the bilateral and multilateral research and development projects to support regional initiatives to tackle desertification, mitigate sand and dust storm and expand productive lands.

Chairs

Prof. Wang Tao

- Director, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences

Prof. Myagmartseren, P.

- Head, the Department of Geography, National University of Mongolia

Speeches

- **Collaboration Project to Combat Desertification in Mongolia**
  Prof. Ho Duck Kang
  Professor, Dongguk University, Korea
- **Pursuit Sustainable Desertification Reversion in Horqin Sandy Land, Inner-Mongolia**
  Dr. Xueyong Zhao
  Executive director of Department of Agro-ecology, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
- **Restoration Practices on Degraded Lands of Mongolia**
  Dr. Khaulenbek, A.
  Head, the Division of Desertification study, Institute of Geography and Geoecology, Mongolian Academy of Sciences
- **Aeolian Desertification in China**
  Prof. Wang Tao
  Director, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences

Collaborative project to combat desertification in Mongolia

Dr. Ho Duck Kang
Professor

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The presentation will be focused on collaborative joint research to combat desertification between the Mongol Institute of Geography and Geoecology and CCDASA of Republic of Korea in Elsentarsi, Mongolia.

The center for combating desertification in arid and semi-arid areas was founded in 2012. It has been supported by the Korea Forest Service, Republic of Korea and will be extended until 2018. The objectives of center is to study scientific and technological desertification matters in arid and semi-arid areas, to make capacity building for graduate students in international society and to learn relevant ways and means how to combat desertification in Asia and Africa. The center also aims to establish networks in the country and to assist specialists in combating desertification through the training. The center is operating scientific and educational programs with the bilateral collaboration of four countries such as Mongolia, Myanmar, Tunisia and Ethiopia.

The specific research categories are following:

1. investigation of plant resources, determination of eco-physiological characteristics and selection of species in arid and semi-arid areas,
2. development of ideal methodologies to combat desertification and agro-forestry models at regional level,
3. monitoring and vulnerability assessment of desertification and
4. establishment of international cooperation network and development for capacity building program to combat desertification.

The presentation will contribute to the on-going efforts to combat desertification by disseminating current research outcomes applicable for combating desertification and by addressing relevant issues. The presentation will provide an overview of the current research and activities. We expect to discuss the direction in which future research should proceed. Through these efforts, we hope to accumulate scientific knowledge that would form the basis for combating desertification.

Pursuit Sustainable Desertification Reversion in Horqin Sandy Land, Inner-Mongolia

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Horqin Sandy Land is located in the eastern part of Inner-Mongolia, and once was one of the most severely desertified lands in northern China. After continued combat of desertification about 30 years, desertification trend started to be reversed since late 1980s, but the reversion trend has been severely challenged by decreasing water availability characterized by drying up of lakes (20 of 22 lakes dried up since 2001) and rivers (two large rivers cross Horqin Sandy Land stopped running since 1999) and consistent reduction of underground water table (30-40 cm per year). As a result, large area of planted trees died of water deficit and natural vegetation degraded, meanwhile desertified land reversion rate is decreasing and land use pressure is growing. Therefore, it is very critical to carry out in-depth research in plant adaptability to changing habitat and demonstrate practically efficient water-saving measures and/or techniques in cropping to combat desertification and develop adaptable management system of land use strategies for pursuing sustainable desertification reversion. Poverty relief is an important side-aided strategy for sustainable desertification reversion and development.

Restoration Practices on Degraded Lands of Mongolia

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In Mongolia, over 1.2 million sq km (77.8 percent) of lands are affected by desertification and land degradation. With the aridization of the climate and increase of anthropogenic pressure on the fragile ecosystems of arid lands, the processes of land degradation will continue exacerbate, leading to further desertification. Due to the fact that the degradation of the landscapes mainly represent by destruction of vegetation cover and degradation of topsoil cover, the erosion processes were and are important subjects of study, and the development of techniques on adaptive-landscape farming systems are mainly directed to localize and liquidate primary causes of degradation (e.g. soil water and wind erosion). Because of woody vegetation provides the main environmental services at the landscape level, adaptive-landscape farming as a system of agroforestry has a diverse ameliorative effect to protect land from erosion.

The soil and vegetation cover degradation is a multi-factorial phenomenon, and measures to eliminate degradation should develop at the various levels. The first and most important level is to assess the contribution of each environmental and socio-economic factor contributing to soil degradation. The second level involves the estimation of the quantitative changes occurring in soil-vegetation cover due to various factors and their combinations in heterogeneous landscapes. At the third level, on the basis of agro-landscape principles, the indicators of adaptive-landscape measures and optimization activities should be elaborated taking into consideration their potential impact to prevent soil degradation and their economic effectiveness as a means of rural livelihood. Thus, an experimental works are needed to improve the current methods of combating degradation/ desertification and integrate technologies for the restoration and preservation of soil fertility. Science and technology level of development are determined, primarily, by the application of these new and emerging methods for assessing the state of degraded lands and the effectiveness of erosion control measures.

Due to the fact that the country has a great diversity of natural conditions, developed to date erosion control measures are not effective enough to solve the problems of soil degradation. Thus, the erosion control of measures should include activities like organizational or management, agro-forestry, agriculture, land reclamation and hydraulic engineering.

Aeolian Desertification in Northern of China

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Director

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Aeolian desertification is land degradation through wind erosion mainly resulted from the excessive human activities in arid, semiarid and part of sub-humid regions in Northern China. To compare the analyses results of remote sensing data in late of 1950, 1975, 1987, 2000 and 2010, we can summarize that the development of aeolian desertified land in Northern China had being accelerated for 5 decades, as its annual expanded rate was 1,560 km^2 during late of 1950 and 1975, 2,100 km^2 between 1975 and 1988, 3,600 km^2 from 1988 to 2000 and -1375 km^2 from 2000 to 2010. The whole situation of desertification comes to be depraved before 2000 and to be improved after 2000. The human impact is much more active than natural one on the process of aeolian desertification which mainly incarnates on the changes of the land-use fashion (from rangeland to farmland) and enhance of landuse intensity (over-cultivation, over-grassing and over-fuelwood collection). The natural vegetation had been destroyed by the human activities that had accelerated to the development or/and control of aeolian desertification. China has made much progresses in understanding and combating aeolian desertification through many efforts for decades and there were many projects have been carried out. One of among them is the National Project of Grain for Green Program and more than 1000 counties in 22 provinces have been included into this project. The objective is to withdraw 3.67 million ha of dry land farming and degraded steppe, and 5.13 million ha of aeolian desertified land suited to reforestation and revegetation will be rehabilitated. There are about 8 million ha of lands under the threats of aeolian desertified land will be brought under control in the next ten years and 26.67 million ha of windbreaks will be planted. The total financial input is estimated to 75 billion Yuan (11 billion US$) what is entirely from the central government.

EST 2017

Sub-Session:

Environmental Education and Ecotoxicology

Session Description

This session consists of 3 reports related to environmental issues such as carbon sequestration in wetland, soil pollution and development remote sensing methodology and 1 report conducted in the building a knowledge management system in scientific organizations. Forest and land cover, and pasture land degradation mappings are developed interferometric, hyperspectral and multitemporal optical data processing by advanced remote sensing method, respectively. The overall classification accuracies for the selected classes were more than 80%. The study results of soil pollution are first important scientific work in Ulaanbaatar city. Soil heavy metals pollutions were detected higher around leather processing factory, solid waste accumulation points of the ger horoolol, soil ammonium and sulfur content were higher in surrounding open market and settlement area. Fourth report determines carbon sequestration present and future prediction amount of different wetlands the Yellow River Basin in China.

Chairs

Dr. Xueyong Zhao

- Executive director, Department of Agro-ecology, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences

Dr. Tsogbadral, Kh.

- Head, the Department of Geography, Mongolian National University of Education.

Speeches

- **Free Tools for Knowledge Management**
  Ms. Linda Mahoney
  Coordinator, MERIT project in Mongolia, Canada
- **Applications of Modern Remote Sensing Technologies for Environmental Studies in Mongolia**
  Acad. Amarsaikhan, D.
  Head, Institute of Geography and Geoecology, Mongolian Academy of Sciences, Mongolian Academy of Sciences
- **The Soil Pollution Problems of Ulaanbaatar City Area**
  Dr. Batkhishig, O.
  Head, the Division of Soil Science, Institute of Geography and Geoecology, Mongolian Academy of Sciences
- **Study carbon sequestration capacity of wetland in the Yellow river basin-Taking Yinchuan plain as an example**
  Mr. Bu Xiao Yao
  Lecturer, Ningxia Polytechnic University, China

Free Tools for Knowledge Management

Ms. Linda Mahoney
Coordinator

MERIT project in Mongolia, Canada

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The Problem: Knowledge in an organization is a valuable resource, but that resource is wasted if it cannot be easily transferred where and when it is needed.

- This problem is widespread; many, if not all, organizations struggle with it.
- Since everyone has the same problem, there are already many solutions to choose from...

A Solution: Building a Knowledge Management System using Free and Open Sourse Software (FOSS)

- Human Components (brief overview; this is usually the biggest part of the "not free" expenses)
  - management and leadership, technical experts:
    - subject matter, content creation, IT, audience!
- Computing Components, Part A: the "not free" stuff (brief overview)
  - the platform: hosting, bandwidth, backups, security, etc.
- Computing Components, Part B: the free stuff!
  - the front end (what everybody sees)
    - Moodle, WikiMedia, many others
  - the back end (the "engine under the hood")
    - frameworks and programming models: Zend, CodeIgniter, CakePHP, Laravel, Yii, programming and scripting languages: Python, Perl, PHP, Ruby, databases: MySQL, PostgreSQL, SQLite, SQL Server, operating systems and platforms: the many flavours of Linux and Unix
- An aside: educational and training resources for skill development in programming, open source technologies, and more
  - free books and learning materials, free courses
- How to choose what is right for your organization (brief overview)
  - what existing skills can you capitalize on?
  - what tools best fit your organization's current and future needs?

Summary:

- It's complicated, but you can do it
- One more step: Measurement
  - set project goals; know what you are trying to achieve
  - identify metrics and measure them
- Share your knowledge of knowledge management:

The journey of creating a knowledge management system also consists of knowledge -- share your new knowledge (both successes and failures) so that your organization becomes a part of the Open Source ecosystem, where the more we share freely, the more enriched we all become.

Applications of Modern Remote Sensing Technologies for Environmental Studies in Mongolia

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The aim of this study is to demonstrate different applications of modern remote sensing (RS) technologies based on optical, synthetic aperture radar (SAR) and hyperspectral RS for environmental studies in Mongolia. For this purpose, the following case studies are highlighted:

Case study 1 – Pasture land degradation study using multitemporal optical RS

Pastureland plays an important role for the Mongolian animal husbandry, because they are grazing home to over 60 million livestock. It makes up about 82% of total land area of the country and represents the largest remaining contiguous area of common pastureland in the world. In recent years, the Mongolian pastureland has been seriously deteriorated. The severe droughts and growing number of livestock have been the main factors for the pastureland degradation in many parts of the country. The aim of this research is to conduct a pastureland change study in Central Mongolia using optical RS technique. As RS data sources, Landsat 5 data of 1987, Landsat 7 data of 2001, Landsat 8 data of 2014 have been used. As the method, a refined minimum distance classification based on the spatial properties of the available land cover classes, has been applied.

Case study 2 – Forest resources mapping using interferometric SAR

Forest is a very important natural resource that plays a significant role in keeping an environmental stability, ecological balance, environmental conservation, food security and sustainable development in both developed and developing countries. The aim of this study is to conduct a forest resources mapping using interferometric SAR images. For this purpose, a forest-dominated site in northern Mongolia has been selected. As RS data sources, multitemporal ALOS PALSAR L-band HH polarization single look complex images acquired on 17 August 2007 and 04 July 2008, were used. To produce a reliable land cover map from the SAR images, a novel refined maximum likelihood classification based on the spectral and spatial thresholds has been constructed.

Case study 3 – Land cover mapping using hyperspectral RS

In recent years, processing of hyperspectral data has attracted many researchers dealing with RS image processing. Unlike the traditional multispectral data taken in the optical range of electro-magnetic spectrum, the hyperspectral data deals with a great number of bands and many attempts are being made to extract reliable information in this field. The aim of this study is to classify land cover types of near Ulaanbaatar area using 242 bands Hyperion hyperspectral data sets. For the actual feature extraction, principal components transformation and spectral knowledge have been used. The output of each of the feature extraction methods was classified using a maximum likelihood classification and spectral angle mapper methods.

The soil pollution problems of Ulaanbaatar city

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Due of rapid increase of Ulaanbaatar city, environment condition is worsening and soil, water, air pollution threating for city peoples life. According by 2014 research, in some areas of capital city found high content of Chromium, Lead and Zink in the soil, exceeding national standard (MNS 5850), such as leather processing factory area of Khan-Uul district, auto service-tire repairing points and some solid waste area of ger horoolol. Soil heavy metal polluted areas mostly sporadic distributed. Comparing background value or natural non-polluted soils surrounding of Ulanbaatar city area, percentage of soil heavy metal pollution are as following: Chromium (Cr)-76.3%, Lead (Pb)-71.1%, Zink (Zn)-80.3 %, Copper (Cu)-65.8%, Cadmium (Cd)-48.7 %, Nickel (Ni)-52.6 %. Specially soil Chromium, Lead, Zink pollution is comparatively higher. The ger horoolol area solid waste accumulation points are also one source of soil heavy metal pollution. The Ulaanbaatar city soil ammonium pollution is 88 % is higher than a non-polluted pasture soil of surrounding area. In some areas, for example: nearby north gate of “Narantuul” open market soil ammonium content was found at 21.1 ppm, 10 times higher than in a normal soils. The 72% soil samples have a higher Sulfur content comparing with non-polluted pasture soils. Primary source of Sulfur content is air pollution and coal burning. The ger horoolol district area is becoming the main source of biological pollution and threatening drinking ground water safety. Improvement of solid, liquid waste management and development of ecotax policy is one of possible way to solve the soil pollution problem of Ulaanbaatar city area.

Study carbon sequestration capacity of wetland in the Yellow river basin-Taking Yinchuan plain as an example

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Integrated techniques of 3S were used to translate the Landsat TM artificial satellite remote sense portrait of Ningxia plain in the Yellow River Basin, and field sites were investigated by GPS, by which the completed wetland resource information were acquired. Also the typical vegetation of wetland Ningxia plain in the Yellow River Basin were investigated to establish the wetland resource database. Carbon sequestration of different wetlands was estimated and their function was analyzed. Results showed that total area of wetland of Ningxia plain was 19.65Ч104 hm^2 accounting for total land area of 3.1%, ranking the first among the western arid and semi-arid regions. The natural wetland area (including river wetland, lake, and wetland) was 17.03Ч104hm^2, accounting for 82.38% of the total, they are located mainly along the Yellow River economic zone. The wetland carbon reserves was of 1502.80Ч104T, accounting for 45.03% of the carbon sequestration of the five major ecosystems (woodland, shrub, grasslands, wetlands and features fruit trees) Ningxia plain in the Yellow River Basin, it was 10 percentage points more higher than the percentage of the global total wetland carbon reserves of the global terrestrial ecosystem carbon pools (10%-35%). Predicted carbon reserves of 2020 is 1593.48Ч104T. Compared with 2014, wetland area will increase 0.34Ч104 hm^2 in 2020, carbon sequestration increase 90.68Ч104T.

EST 2017

Sub-Session:

Environment and Economic Development

Session Description

This sub-session is Environment and Economic Development in EST 2017. Dr Dong Suocheng will presents that three main high-speed railway channels and one channel is trans-border high-speed railway of China-Mongolia-Russia Economic corridor, based on comprehensive analysis of significances and condition of the trans-border regions. Mr. D.Erdenebayar will presents that Mongolian Parliament approved "Sustainable Development Vision of Mongolia-2030" in 2016. This vision has divided into 4 objectives across 14 sectors to implement 44 goals with 3 step processes. In addition, Regional development policy of Mongolia will be developed and the priority sectors and zoning will be defined through spatial planning. Dr Dong Xiaofeng will presents that the development of railway passage in the South Silk Economic Belt was divided into two periods which are the opening and development of the New Eurasian Continental Bridge period and the new development period after the publishing of the Silk Road Economic Belt. Then, the problems and challenges of the railway passages in the Silk Road Economic Belt. Finally, "Digital Baikal" is a future digital platform in Baikal region that about complex social-ecological monitoring, a new-era software apparatus for scientific analysis and prognosis and decision support system for regional government will be introduced by Dr. Alexander Kononov.

Chairs

Dr. Altanbagana, M.

- Head, Division of Social-Economic Geography, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Dr. **Delgerjargal, D.**

- Senior lecturer, School of Agroecology, Mongolian State University of Agriculture

Speeches

- **Study on Conditions and Layout of Trans-border High-Speed Railway of Russia, Mongolia and China**
  Dr. Dong Suocheng
  Leading Professor, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
- **Economic Regional Concept for Sustainable Development in Mongolia**
  Mr. Erdenebayar, D.
  Head, Sector's Development and Policy regulation division, National Development Agency, Mongolia
- **Railway Passage Development and Security Strategy of the South Silk Road Economic Belt**
  Prof. Dong Xiaofeng
  Professor, Beijing Jiaotong University, China
- **Digital Baikal**
  Dr. Alexander Kononov
  Deputy Director, Institute of Earth's Crust, Siberian Branch of Russian Academy of Sciences

Study on Conditions and Layout of Trans-border High-Speed Railway of Russia, Mongolia and China

Dr. Dong Suocheng
Director & Leading Professor

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The paper, put forth the layout outline of trans-border high-speed railway of China-Mongolia-Russia Economic Corridor, based on the comprehensive analysis of the significances and conditions of the trans-border regions, in the background of the Belt and Road Initiative. According to the above evaluation, the authors proposed three main high-speed railway channels, including that of Beijing-Shenyang-Changchun-Vladivostok-Khabarovsk, Harbin-Manchuria-Chita–Ulan-Ude, Beijing- Hohhot-Ulan Bator-Ulan-Ude and other two branch high-speed railway lines.

REGIONAL ECONOMIC TAKE ON SUSTAINABLE DEVELOPOMENT OF MONGOLIA

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The Sustainable Development Goal was adopted in September 2015 by the UN General Assembly and the "Sustainable Development Vision of Mongolia-2030" was adopted by the Parliament resolution №19 in February 2016. "Sustainable Development Vision of Mongolia-2030" is divided into 4 objectives across 14 sectors to implement 44 goals with 3 step processes: a) sustainable economic development, b) sustainable social development, c) environmental sustainability, and d) governance for sustainable governance. According to the "Law on Development Planning", the National Development Agency is the agency responsible for implementing the above mentioned document. In addition, mid and long-term development policy documents are being coordinated with the sustainable development vision and spatial planning concepts.

Initially the regional development policy will be developed and the priority sectors and zonings will be defined through spatial planning. Mongolia's industrial sectors, green trade, green industries and green production researches are currently in works. Step- by-step processes of developing processing industries are in action as well as raw material supplying systems, cluster systems of transportation and logistics of production supply is also being developed. Within this framework a total of 100 economic spatial planning studies divided into 7 groups are planned, the studies will take into consideration the regional development policies of neighboring countries. In this regard, an "International Conference on Regional Development practices" will be organized in May of 2018.

Within the framework of the regional development policy spatial planning studies, state and sector development policies, local development policies will be developed and implemented through major projects underlying them through online planning systems and innovative project management tools.

Railway Passage Development and Security Strategy of the South Silk Road Economic Belt

Dr. Dong Xiaofeng
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The opening of the New Eurasian Continental Bridge Railway is the mark of the Silk Road Economic Belt. Railway transport is the dominant and key transport method of the Silk Road Economic Belt. This essay discusses the railway passage development and security strategy of the South Silk Road Economic Belt. First, the development of railway passage in the South Silk Road Economic Belt was analyzed. The development was divided into two periods which are the opening and development of the New Eurasian Continental Bridge period and the new development period after the publishing of the Silk Road Economic Belt. Then, the problems and challenges of the railway passages in the Silk Road Economic Belt area are dissected. The only major railway of the Belt is the Sino-Russian railway, other railway lines are still not opened, which caused the challenges of security. Meanwhile, undeveloped transport system and layout in the western area become the bottleneck of the Economic Belt development. Finally, strategic thoughts of the railway development in the South Economic Belt were put forward. On one hand, the new railway which connects different countries should be developed, especially the railway between China and Pakistan, the channel connects China with the Central Asia-West Asia-Africa and North Asia and the railway between Southwest China and Southeast Asia-North Asia. On the other hand, the development of interior railway passages should be enhanced, especially, the Lanzhou-Chongqing Railway should be open as soon as possible. The railway across the middle of the Loess Plateau should be explored. The Chengyu-Xining railway should be finished. The improvement of northwest railway and the opening of the railway between the Northwest China and the Burma are also important.

Digital Baikal

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In the conference talk, we perform the forthcoming scientific and social project "Digital Baikal", that was announced in the International forum of young researchers "Life Science for Green Technologies" within the forum "Baikal" (June 19-25, Lake Baikal, Russia), and kick-started during the Foresight of Baikal Region (September 7-10, Lake Baikal, Russia).

"Digital Baikal" is a future digital platform, which is aimed at the following goals:

- Complex social-ecological monitoring of Baikal Region.
- A new-era software apparatus for scientific analysis and prognosis.
- Decision support system for regional government and authorities.

The platform is assumed to contain the following modules and features:

- Database of expert knowledge (such as geographical, geological, climatic, ecological etc.) provided by regional authorized holders, such as Irkutsk Scientific Center and local universities.
- A new technique for coding and elaboration of different scientific data, based on a specific language for semantic description.
- An IT-module with a set of relevant mathematical (both static and dynamical) models of natural processes, and an option of self-analysis based on artificial intelligence due to original approach.
- Geo-information system for visualization of the input data and the outcome of the system analysis.

In the talk, we present the detailed and actual structure of the announced digital platform, and give a comprehensive description of its features, advantages, know-hows and, possibly, first results.

EST 2017

Sub-Session:

Waste Management and Water Technology

Session Description

First report examines drinking water composition in water supply of Ulaanbaatar city is not revealed any changes depending on seasons and after chlorinated organics were not exceeded. Second report describes detection of groundwater pollution using Electrotomography equipment. Third report proposes development of ground water management system based on managed aquifer recharge around capital Ulaanbaatar of Mongolia. Fourth report suggests issues related to engineering construction and establishment water protection buffer zones of Baikal lake for preventing pollution in Russia.

Chairs

Dr. Prof. Daniel Karthe

- GMIT German Mongolian Institute for Technology

Dr. Odontsetseg, D.

- Head, Division of Water Resource & Utilization, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Speeches

- **Hydrological study for Chlorinated Drinking Water**
  Dr. Amarsanaa, B.
  Senior Scientist, Laboratory of Ecological Chemistry, Institute of Chemistry and Chemical Technology, Mongolian Academy of Sciences
- **The Results of the Application of Electrotomography for the Detection of Polluted Groundwater Flows in the Urez Zone of the Listvyanka Settlement**
  Dr. Minaev Aleksandr Viktorovich
  Head, the Innovation Department, Limnological Institute, Siberian Branch of Russian Academy of Sciences
- **Evaluation of Managed Aquifer Recharge Methods for Semi-Arid Sub-Arctic Region**
  Mr. Nasanbayar, N.
  Lecturer, Environmental Engineering Department, School of Civil Engineering and Architecture, Mongolian University of Science and Technology
- **Water protection zone of Lake Baikal on the basis of the landscape-hydrological approach**
  Dr. Olga V. Gagarinova
  Head, Hydrology and Climatology Department, V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences

Hydrological study for Chlorinated Drinking Water

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In this study, we conducted to determine the seasonal dynamics of chlorine organic compound and physico-chemical characteristics of the two sources for drinking water in Ulaanbaatar city. There are seven sources of drinking water wells contributing to the customers a drinking water. We chose two sources among them such as: “Uildver” and “Mah kombinat” station, after and befor chlorination processes, which is being used since 1959 in Ulaanbaatar city water supply. In 2012, new water supplying fonds were established in Gachuurt, Yarmag and recently, in 2014 Buyant-Ukhaa.

“Uildver” source shows pH 6.11-6.94 and the conductivity (EC) was 41.5-60.2 mS/m. The general hardness was 3.8-5.9 mg-eqv/l, general mineralization is classified as SO_4^{2-} - Ca^{2+} and Mg^{2+} which grades up to 274.96-470.8 mg/l.

The source of the “Mah kombinat” shows pH 6.14-6.85 and the conductivity (EC) was 54.5-62.4 mS/m. The general hardness was 4.9-6.0 mg-eqv/l and the general mineralization is classified as SO42- - Ca2+ and Mg2+ which grades up to 420.4-520.7 mg/l. In addition, cations are the main source of calcium ion in the drinking water of these two sources and SO_4^{2-} and HCO^{3-} ions dominate as the major anions. The result is matching to the requirements of Drinking water standard MNS 0900:2016 is not revealed any changes of composition depending on seasons.

The qualitative analysis of chlorinated organic compounds approached by using of GC-MS methods in drinking water pre- and post-chlorination processes and that showed presence of several organic constituents and two to three chlorinated organics were not exceeded the national standards. Moreover, we analyzed micro-elements composition with ICP-MS measurements.

The Results of the Application of Electrotomography for the Detection of Polluted Groundwater Flows in the Urez Zone of the Listvyanka Settlement

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As an example, you can imagine the results of research on one of the profiles, which originates in front of Suvorov Street 2, passes through the creek Sennushka with a total length of 285.5 meters. Based on the results of the studies carried out on this profile, four low-resistance zones from 0-50 Ohm * m were identified. These zones are allocated on the general background of the profile, since they differ in 5-15 times from the values of the resistances on the profile. These zones can be confined to the clayey rocks of the layer, but they are excluded in the geological structure of the coastal zone of the investigated site. In connection with this, the reason for this is groundwater, which conducts an electric current thereby allowing to record the data of the zone. One of these low resistance zones was fixed at a depth of 6-7 meters from the height of the water's edge.

Analysis of water samples along the creek Sennushka from the upper to the mouth showed an increase in the chlorine content from 1400 to 6300 μg / l, potassium from 2,400 to 3,400 μg / l, sodium from 2,500 to 68,000 μg / l, phosphorus from 33 to 108 μg / l and sulfur from 8500 to 10,200 μg / l. Distribution E. Coli as the main indicator of household pollution in the river from the upper to the mouth varies from 0-to 30-473 for different seasons. In addition, the well was drilled with a small installation.

Complex studies carried out using the example of one of the revealed underground streams have shown that, unlike surface watercourses, in which the content of nutrient elements on the segment from the source to the mouth increases insignificantly, increased pollution is established in underground waters.

Evaluation of Managed Aquifer Recharge Methods for Semi-Arid Sub-Arctic Region

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Ulaanbaatar, the capital of Mongolia, shows a highly dynamic urban and industrial development, with a strong increase of population numbers. Thus, water demand is continuously rising while water availability is in general low and less reliable. The semi-arid and cold environment shows a high variability in precipitation and river discharge, with a general tendency towards decreasing water availability due to increasing air temperatures and thus rising potential evaporation. The groundwater aquifer located near Ulaanbaatar capital city of Mongolia, is the only source of water supply and it is important to ensure that groundwater is available now and for the future. The main watercourse in the vicinity of the city is the Tuul river, fed by precipitation in the nearby Khentii Mountains. However, due to the absence of precipitation during winter and spring, the river bed usually runs dry during that time, and observations show that the dry period has been extending within the last years. Since many decades, the water supply of Ulaanbaatar is exclusively based on the use of groundwater in the Tuul valley. However, in parallel with the city's development, the extended groundwater aquifer shows a clear decline, and the groundwater levels drop significantly. Therefore, a groundwater management system based on managed aquifer recharge is proposed and a strategy to implement these measures in the Tuul valley is presented. It consists of an enhancement of natural recharge rates during the summer flood period, an increase of groundwater recharge through melting ice in the river bed, as well as the construction of underground dams to retain groundwater in the river valley. Side effects include the implementation of recreation areas with green vegetation parks, as well as a possible improvement of the city's air quality in winter by means of increased air humidity followed by aerosol deposition in artificial precipitation.

Water protection zone of Lake Baikal on the basis of the landscape-hydrological approach

Dr. Olga V. Gagarinova
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The Water Code of the Russian Federation, the Federal Law “On the Protection of Lake Baikal”, the scheme of ecological zoning of the Baikal Natural Territory determine the legal grounds for the allocation of the Water Protection Zone of Lake Baikal, but it was not installed until 2015.

Establishment of the water protection zone along the boundary of the central ecological zone of Lake Baikal in 2015 combined strict restrictions on the nature use of the two zones on the territory of more than 50 thousand km2. The current situation led to the need to revise this decision and develop a scientifically-based project for the water protection zone of Lake Baikal.

The appropriateness of the landscape-hydrological justification for the size of the water protection zone rests on the idea of hydrologic stock-forming and flow regulating functions of landscapes that determine the formation and transformation of local runoff as it moves from the watershed to the draining water body. The implementation of the project of water protection zoning on landscape-hydrological principles provides for maximum protection of Lake Baikal from the receipt of pollutants with surface and ground runoff from adjacent coastal areas due to natural processes of self-purification in landscapes and soil-soil layers.

The main criteria for the water protection zone width are the conditions when all pollutants outside the established water protection zone are drained by the tributaries of the lake and do not enter directly into Lake Baikal, as well as the protection of groundwater from vertical penetration of pollutants.

On the territories of settlements located on the coast of Lake Baikal, it is planned to develop individual projects of the sections of the lake’s water protection zone in accordance with existing and prospective plans of construction and engineering and technical development of the territory.

EST 2017

Sub-Session:

Ecological Stability

Session Description

This sub-session on ecological stability covers topics such as ecological adaptability, urbanization and tourism effect on environment in Mongolian plateau and Baikal region. Assessment of vegetation patterns in Mongolian plateau is important to develop strategies for conserving the biodiversity and adaptive management under the climate change. Urbanization around Baikal region has negative impact on the quality of the environment such as water and soil quality. The development of tourism benefits on social and economic, however ecological effect of tourism is an important research content but it has not sufficient.

Chairs

Dr. Alexander Kononov

- Deputy Director, Institute of Earth's Crust, Siberian Branch of Russian Academy of Sciences

Dr. Nyamdavaa, B.

- Senior Scientist, Division of Soil Science, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Speeches

- **Effects of paleo-climate development and Climate Change indicated by lakes and glaciers in Western Mongolia**
  Dr. Michael Walther
  Senior advisor, Institute of Geography and Geoecology, MAS
- **Environmental aspects of urbanized territories in the Baikal region**
  Dr. Andrey A. Sorokovoy
  Acting Deputy Director, V.B. Sochava Institute of Geography, Siberian Branch of Russian Academy of Sciences
- **Research framework and mechanism of ecological effects of tourism in developing areas**
  Mr. Xia Bing
  Doctor Candidate, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Effects of paleo-climate development and Climate Change indicated by lakes and glaciers in Western Mongolia

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One important part of the research of IGG focusses on the changes of climate effects in high mountain regions, namely of the Mongolian Altai. Ground checked geomorphological mapping paired with remote sensing data in key areas of the Mongolian Altai are supplemented by recent climate data with own automatic weather stations, which are supporting virtual weather stations in the summit regions of Kharkhiraa Mts. and Tsengel Khairkhan Uul.

Our glacier mapping results produced 627 debris-free Mongolian Altai glaciers with an area of 334.0 ± 42.3 km2 and 211 debris-covered glaciers covering 12.2 ± 1.2 km2 as of 2016. These data are available for download through the Global Land Ice Measurements from Space (GLIMS) initiative. We examined a subsample of 206 glaciers that were mapped in 1990, 2000, 2010, and 2016. Analysis revealed that from 1990 to 2016, glacier area reduced by 43% at 6.4 ± 0.4 km2 yr-1. Glacier shrinkage was greatest between 1990-2000 with a rate of recession of 10.9 ± 0.8 km2 yr-1 followed by 2010-2016 at 4.4 ± 0.3 km2 yr-1. We found that rates of glacier recession were statistically significant with intrinsic glacier parameters including; mean, minimum, and range elevations, mean slope and aspect. Furthermore, climatic trends and anomalies indicated that summer temperatures were greatest during periods of high glacier recession. The older glaciation extension is determined by extinct Little Ice Age terminal and lateral moraines including older substages. Younger Dryas stages, Last Glacial Maximum (LGM) and maximal glacier extension is clearly to be detected at Kharkhiraa and Tsengel Khairkhan Uul.

The Holocene Lake development could be observed at Khar Nuur, Ihk Hag Nuur, Shaazgai Nuur and Kharungiin Baga Nuur. Holocene lake levels are located in 10 - 12 m, 4 - 5 m and 1 m above the recent lake level at Khar Nuur.

Environmental aspects of urbanized territories in the Baikal region

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Urbanization is a multifaceted phenomenon from the social point of view. On the one hand, city as a special form of socio-geographical and socio-cultural space organization is a factor in the progressive development of society. On the other hand, the urban processes have a negative impact on the quality of the urban environment. As the rate of urbanization increases, the quality of life in the largest cities depends on natural environment protection degree. On the basis of statistical data, we consider the main factors of urban processes in the Baikal region. We distinguished the role of geodemographic factors in the transformation of urbanization and investigated the life quality of urban population in the Baikal region. Demographic and ecological aspects of the life quality of are represented by the example of regional centers (Irkutsk, Ulan-Ude, and Chita).

One of the main environmental aspects of the living standard is the water resource quality. Assessment of the level of anthropogenic impact on water resources in the Baikal region has shown that the highest degree of this impact on the hydrosphere is observed in the Irkutsk region. The main loads are associated with the volumes of water intake and sanitation in cities and industrial centers. In the Republic of Buryatia and in the Trans-Baikal Territory, natural waters are basically impacted by mining enterprises, mainly through the large discharge of pollutants into water bodies. The water quality of rivers in the economically developed territories of Buryatia and Trans Baikal is low, and the state of surface water resources in the Irkutsk region is satisfactory.

We carried out mapping of soil degradation and soil contamination in the Baikal region. The territory of the investigated region is formed by the Central Siberian, Baikal-Dzhugdzhurskaya, and South Siberian natural regions. More fractional subdivisions of the territory on the landscape and geochemical provinces are identified by a complex of factors of potential danger of soil contamination and their degradation during nature use. The map shows soil contamination zones with excess of maximum permissible concentration of pollutants, their gross emissions, industrial sources and their contribution to atmospheric pollution.

Research framework and mechanism of ecological effects of tourism in developing areas

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The development of tourism positives economic and social benefits, also has an important influence to the local ecological environment. Ecological effect of tourism is an important research content of ecology, geography and economics. However, the current system of research is not insufficient, and the research framework needs to be further improved. Based on the analysis of the existing literature and summarized the previous research results, combing the current status and progress of tourism ecological effect, from angle of the tourism industry system, the framework and key contents of tourism ecological effect analysis are systematically analyzed, furthermore, the influence mechanism of tourism ecological effect is summarized.

INFORMATION OF FIELD TRIP

A two days field trip to the Khentii Mountains in Mongolia will be organized direct after the EST 2017. The field trip route leads to the natural zone of forest-steppe and passes through strictly protected area Khan Khentii and the beautiful National Park Gorkh-Terelj. The field trip will focus on desertification, permafrost, hydrology, forest and environmental monitoring activity issues in Mongolia.

Date: 28-29 October, 2017

Day 1 (28 Oct.2017)

Time	Visiting sites	Key words	Speakers
09:00 – 10:20		**Start to the field trip from the Corporate Convention Center**	**IGG Team**
10:20 – 10:40 (Stop 1)	**Bus Nuur**	**Explanation and discussion: Permafrost features at the southern border of Mongolian permafrost; Pingo development**	**Dr. A.Dashsteren & Dr. M.Walther**
11:00 – 11:20 (Stop 2)	**Tonyukuk**	**Tureg monument**	**IGG Team**
11:20 – 12:00 (Stop 3)	**Ar Janchivlan /AWS site/**	**Explanation and discussion: Pasture degradation and climate change & Coffee break**	**Dr. O.Batkhishig & IGG Team**
12:20 – 12:40 (Stop 4)	**Zuun Mod sanded area**	**Explanation and discussion: Desertification and land erosion**	**Dr. A.Khaulenbek**
12:50 – 13:20 (Stop 5)	**Chinggis Khaan statue**	**Sightseeing in own responsibility**	**IGG Team**
13:30 – 15:20 (Stop 6)	**Khaan Jims Camp**	**LUNCH**	**IGG Team**
15:50 – 16:20 (Stop 7)	**Entrance Ovoo of Gorkhi-Terelj National Park**	**Traditional Mongolian culture, Tuul river hydrology, Nature and Environmental protection and protected areas policy**	**IGG Team & Dr. D.Odontsetseg & Dr. M.Walther**
17:00 – 17:20	**Resort World Terelj Hotel**	**Check-in hotel**	**IGG Team**
18:00 – 22:00	**Resort World Terelj Hotel**	**Banquet**	**IGG Team**

Weather conditions: Air temperature ranges are from -5°C to -15°C, approximately 10 hours of daylight, and usually clear skies.

Day 2 (29 Oct.2017)

Time	Visiting sites	Key words	Speakers
08:00 – 09:00	**Resort World Terelj Hotel**	**BREAKFAST**	
09:30 – 10:20 (Stop 1)	**Monastery**	**Discussion of the forest existence and sightseeing**	**Dr. M.Walther & D.Ganbat**
10:20 – 11:20 (Stop 2)	**Turtle Rock**	**Genesis, age and morphologic feature of upland tors in Mongolian granite plutons & Horse and camel riding**	**IGG Team & Dr. M.Walther**
12:00 – 13:00	**Resort World Terelj Hotel**	**LUNCH**	**IGG Team**
13:00 – 14:30		**Departure to Ulaanbaatar**	**IGG Team**
14:30 – 16:00	**Ulaanbaatar**	**Shopping: Gobi Kashmir Factory shop**	**IGG Team**

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