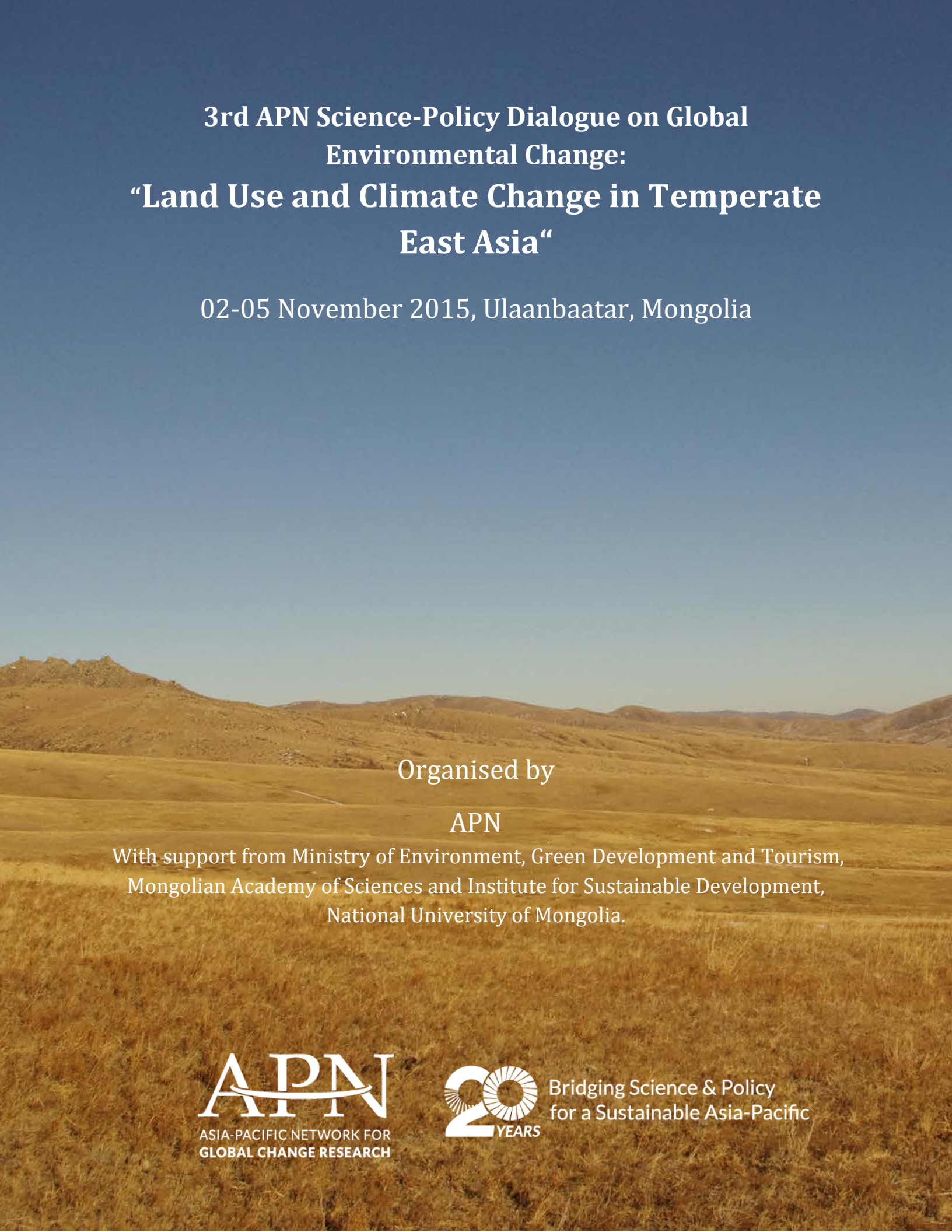
3rd APN Science-Policy Dialogue on Global Environmental Change:

"Land Use and Climate Change in Temperate East Asia"

02-05 November 2015, Ulaanbaatar, Mongolia



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APN
ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH

20 YEARS
Bridging Science & Policy for a Sustainable Asia-Pacific

This proceedings provides an overview of APN's Third Science-Policy Dialogue, which was held from 02-05 November 2015, Ulaanbaatar, Mongolia

Reported by

APN Secretariat

East Building 4F, 1-5-2 Wakinohama Kaigan Dori

Chuo-Ku, Kobe 651-0073

JAPAN

Tel: (+81) 078-230-8017 | Fax: (+81) 078-230-8018

Website: www.apn-gcr.org |

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Executive Summary

This report provides information on the findings and recommendations from Asia-Pacific Network for Global Change Research (APN) 3rd Science Policy Dialogue on Global Climate Change: Land Use and Climate Change in Temperate East Asia that was held in Ulaanbaatar, Mongolia from 02-05 November 2015. The dialogue was organised by APN in collaboration with the Ministry of Environment, Green Development and Tourism of Mongolia, and Mongolian Academy of Sciences and Institute for Sustainable Development, National University of Mongolia. The three-day dialogue and field visit was attended by 68 senior and early-career scientists, policy makers and civil society representatives from China, Mongolia, Japan, Russia Federation, Republic of Korea (ROK) and USA.

Although climate change affects all counties, the diverse geographic and social-economic status have created different scales in terms of effects on land use at national levels in Temperate East Asia (TEA). Mongolia is facing prominent problems in desertification and increasing surface temperature. Semi-arid regions of China face aridity trends and, while Japan and ROK face forest land management issues due to decreasing populations and increasing aging rates. In order to address these issues, the sub-regional Science-Policy Dialogue provided an opportunity for scientists, policy makers and civil society to share their knowledge, experience and best practices.

The dialogue identified that TEA countries have different regulations and action plans to address land change and climate change issues. Mongolia has laws and regulations to address climate change but lacks a stronger implementation and policy evaluation mechanism. A stronger government structure as identified in China has policies and implementation plans, although there is less public awareness on climate impacts. All five countries are facing land use management issues due to rural urban migration and decreasing population in rural areas. Therefore, land use issues studies should be designed in a transdisciplinary and interdisciplinary manner to cover all socio-economic issues that relate to land use and land change.

Communication gaps between scientists and policy makers slow down the transfer of knowledge and establishment of science-based policies. To enhance communications, the dialogue stressed that regular communication among all stakeholders, including the media, should continue. Further, scientific research should consider co-design and co-production together with policy makers and other stakeholders to respond to land issues at local and national levels. This will not only enhance communication and understanding of the diversity and requirements of each stakeholder but will also draw increased attention from the media.

Participants shared successful stories of science-based policy formulation to address biodiversity and ecosystem services issues. To increase the quality of scientific research and future projections, more ground-level data collection and data sharing are needed. Integrating local data and traditional/indigenous knowledge with global knowledge will lead to sustainable development while reducing environmental impacts.

One final point that is pertinent to note in this science-policy dialogue was the clear overlap of problems and issues that were consistently raised and were more often than not interrelated. This includes issues related to the transfer of information and who is responsible for this between the various stakeholders, communication and how/what to communicate, knowledge management both vertically and horizontally, and the need for better understanding of all stakeholders to achieve sustainable development.

PART ONE – OUTCOMES & RECOMMENDATIONS

Take Home Messages

Science-Policy Engagement

- Short-term solutions for immediate problems are observed more frequently in the policy sector than long-term strategic solutions.
- There is a need for continuous monitoring of policy implementation.
- A mechanism to control migration and increase opportunities in rural areas needs consideration.
- Most factors that affect sustainable land use are complex and transdisciplinary in nature, and frequently change.
- Policy planning needs to reflect various social and natural factors/drivers that affect land use. In addition, frequency of change in socioeconomic data varies in each country and policy makers need to consider and adapt to these changes accordingly.
- Decision-making and policy formulation related to livestock production needs to be undertaken carefully considering underlying drivers such as land abandonment.
- Decision makers need to consider the uncertainty of scientific data and adapt policy plans to minimise impacts.
- In situations requiring immediate action, individual decisions provide more effective solutions than group decisions due to time limitations for coordination.
- International collaboration can persuade and support national policy formulation.
- Political will and commitment are very important in addressing land use issues.

Knowledge Management

- Ethical aspects are an important factor in knowledge management.
- Involvement of religious leaders in climate and global change issues may help to enhance awareness among policy makers and the public on climate issues.
- Considering different governmental structures and regulations, involvement of a country's foreign relations ministry is essential to avoid contradiction of regulations and to facilitate smooth communications between foreign entities and national governments.
- To properly implement a local environmental programme, general public awareness and understanding is vital for its success.
- Journalist engagement is crucial to transfer knowledge.
- In some countries, Non-governmental organisation (NGO) and community-level organisation engagement is vital to enhance public participation in land use management.
- Similar to scientific knowledge, traditional knowledge plays a crucial role in knowledge management.

Communication

- Co-designing scientific research and, from the results, co-production of policy-relevant information for decision-making bodies may aid the decision-making process.

- Media can be a bridge between science and policy-making; therefore scientists should involve the media to disseminate their outcomes.
- Methods for effective communication are on a case-by-case basis. Scientists need to be able to adopt effective strategies based on circumstances and level of policy makers involved.
- High level politician involvement and regional or international engagement in research activities may increase research credibility, which may in turn attract media and policy attention.
- Scientists and policy makers need to consider online/social media as an alternative tool to convey messages to the public.
- Using non-technical language and translating research outcomes to local language(s) will attract more readers.
- Establishing a media database in Temperate East Asia will enhance media outreach through easy access to journalists' contact information.
- Public awareness of climate change and environmental issues vary from individual to individual. Factors that may affect the level of public awareness are residential location (rural or urban), internet accessibility, financial status, language skills, education level and age. Therefore, awareness-raising programmes need to consider these factors.

Research Needs

- Problems faced during transformation of present development to sustainable development are required to examine and identify effective transformation strategies.
- Comparative studies on costs and benefits between urban and rural living need to be undertaken and shared with the public.
- Analysis is needed to identify drivers that cause dry landscapes in Mongolia.
- Ground-level studies need to be undertaken to understand the relationship between climate change and climate variability, and local phenomena.
- Long-term, cross-scale research that covers different types of spatial scales and considers internal and external drivers and constraints.
- Studies on environmental cost analysis and sharing results with decision makers to reduce the potential environmental cost that may arise through import and export of the agricultural product.
- New models to investigate empirical relationships between species composition and remote sensing data will help to enhance sustainability assessments.
- Detail analysis to understand the relationship between local level population changes and subsequent impacts on land use are important and should be investigated.

Capacity Development Needs

- Capacity development activities for farmers and the public to identify and resolve land issues are needed.
- Training of scientists in communicating scientific results in non-technical language that can be understood by the general public.

- Capacity development for journalists to use information from advanced data collection methods and international language skills will improve the accuracy and quality of information that is delivered to the public.
- Capacity development of the general public on how to use climate information (for example, early warning system information) should be enhanced.

2. Recommendations

National

- Stronger monitoring & evaluation systems will improve the effectiveness of policies. Countries such as Mongolia, who have stronger policies, need more initiatives to strengthen monitoring and evaluation processes. Increasing public awareness might help to reduce future impacts.
- New initiatives to control rural-urban migration such as offering free consultation as well as financial and technological support for business development in rural areas.
- There is a need to evaluate (and identify specific evaluators) the outcomes of decision-making and resource utilisation.
- In the knowledge management process, coordinating institutions/organisations between the ministries and scientific institutions can be beneficial.
- Effect of human population change on land use change is a socio-economic problem that needs policy makers' attention.
- Decision makers should consider potentially available cropland abandoned land area and promote re-cultivation to respond effectively to problems of food security.

Regional

- Integration of local knowledge, data and practice with sub regional studies.

International

- To achieve green development it is essential to have close cooperation with international organisations and partner countries.

Recommendations for future dialogues

- Identifying media spokesperson before the event will help to convey the message clearly to media.
- Organizers should consider preparing a press release and event agenda in local language in advance of the event. This may enhance local media attention.
- Increase policy makers' participation for such dialogues to enhance their voices; this will also promote a neutral dialogue among scientists and policy makers.

PART TWO – COMPREHENSIVE REPORT

1. Background

More than fifty percent of the Earth's land surface has been directly modified by human actions. The indirect consequences of these actions affect everywhere on the Earth (Hooke & Martín-Duque, 2012). One of the consequences is the contribution to net greenhouse gas (GHG) emissions. According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), the average annual total GHG flux is 10–12 $GtCO_2eq$ from agriculture, forestry and other land uses. On the other hand, land also plays a crucial role in absorbing and/or preventing the release of CO_2. Therefore, it is vital to enhance sustainable land management ecosystems that support both adaptation and mitigation to reduce climate change impacts. The IPCC AR5 further explains that mitigation potential of land use changes are highly dependent on broader factors related to land-use policy and patterns (Edenhofer et al., 2014). A study carried out by the Global Land Project (GLP) Sapporo nodal office shows that there are 10,862 journal articles related to land science. (Watanbe Teji, Shibata Hideaki, Ishihara Masae, Yoshimura Nobuhiko, & Kohyama Takashi, 2014). However, use of these scientific findings in policy formulation is still unclear.

With the above background, the APN Temperate East Asia Science-Policy Dialogue (TEA-SPD) aims to share scientific knowledge on effective land management with policy makers and strengthen communications and interlinkages between the science and policy communities. Ultimately, it aims to aid effective policy formulation through knowledge sharing.

2. Activity Summary

The TEA-SPD was a three-day event that took place in Mongolia under the theme "*Climate change and land management*". The dialogue engaged scientists, policy makers and young scientists from China, Mongolia, Japan, Russia and Republic of Korea, as well as representatives from local and international organisations. The dialogue was organised in collaboration with the Ministry of Environment, Green Development and Tourism of Mongolia, Mongolian Academy of Sciences and Institute for Sustainable Development, National University of Mongolia.

The dialogue consisted of six sessions, including rapid talks from experts, knowledge-sharing panel sessions, games, café kiosks, roundtable sessions and daily media round-ups in the first two days. A synthesis session was held on day three and a field visit to Hustai National Park on the final day. Dialogue themes covered a range of important issues including:

- Climate and rural land management changes
- Land use change and its impacts on biodiversity and ecosystem services
- Extreme events and land degradation in drylands in the region
- Sustainable land use practice for mitigation and adaptation

3. Objectives

- To provide scientific input to policy- and decision-making, and strengthen interactions among scientists and policy makers. Especially, the dialogue aims to share recent advances in scientific knowledge related to land use management and global emissions as outlined in the IPCC AR5 and Global Land Project publications.
- To help to identify policy makers' priorities for sustainable land use management.
- To identify future regional action and initiatives for sustainable land use management.
- To provide a report and policy brief for distribution as an outcome of the dialogue.

4. Outcomes

- Attended by a total of 68 participants including youth from Temperate East Asia participated.
- Shared recent advances in scientific knowledge in in land use science in Temperate East Asia.
- Identified knowledge and communication gaps between science and policy makers
- Produced two publications - a policy brief and workshop proceedings - with an offset of recommendations.

5. Partners

- Asia-Pacific Network for Global change research (APN) - main organiser and financial donor.
- Ministry of Environment, Green Development and Tourism of Mongolia.
- Mongolian Academy of Sciences.
- Institute for Sustainable Development, National University of Mongolia.

Special thanks to other collaborating institutions

- Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS).
- Integrated Research System for Sustainability Science, Department of Urban Engineering, The University of Tokyo.
- A.V. Zhirmunsky Institute of Marine Biology, Far East Branch of the Russian Academy of Sciences.

Opening Session

Asia-Pacific Network for Global Change Research (APN), with its partner institutions, embarked on its 3rd Sub-regional Science-Policy Dialogue on Global Environmental Change: Land Use and Climate Change in Temperate East Asia (TEA-SPD) from 02-05 November 2015 in Ulaanbaatar, Mongolia. The dialogue was attended by a total of 68 participants comprising 38 international participants and 30 local participants. Mr. M. Khurelsukh, Vice Minister, Ministry of Environment, Green Development and Tourism of Mongolia provided welcome remarks and officially opened the TEA-SPD. This was followed by welcome remarks from Mr. Bayarbat Dashzeveg, APN national Focal Point (nFP) for Mongolia, Ministry of Environment, Green Development and Tourism, and Mr. Hiroshi Tsujihara, Director of the APN Secretariat.

In his welcome speech, Mr. Khurelsukh emphasised climate changes issues facing Mongolia. Especially, he noted that climate data from the past 73 years shows an increase of mean air temperature at the land surface by 2.1°C and a precipitation decrease by 7% in Mongolia. Further, he stated that survey results in 2010 show that 77.8% of the total territory of Mongolia is affected by some level of desertification. In response to these climate issues, the Government of Mongolia has committed to increasing investment in environmental protection and restoration by 30% by 2030. To achieve the economic development in an environmentally sustainable manner, the government of Mongolia is interested in cooperating with international organisations and other countries in areas of combating desertification, land degradation, and mitigation of climate change as well as advancing technological solutions for climate change issues.

During his welcome remarks, Mr. Tsujihara noted that changes in climate have caused impacts on natural and human systems on all continents and across the oceans. He stated that, based on the IPCC AR5, the most cost-effective mitigation options for food security and sustainable development is through agriculture and cropland management, grazing land management, and restoration of organic soils. He stressed the importance of the TEA-SPD topics and that APN has been supporting activities in land-use and land-cover change since its establishment and mainly through APN's scientific research agenda under the theme of changes in the atmospheric, terrestrial and marine domains. Over the years, APN has provided support to a number of activities that include the Land Use Cover Change (LUCC) joint project undertaken by the global change programmes IHDP and IGBP.

Dr. Tsogtbaatar Jamsran, APN Scientific Planning Group (SPG) Member for Mongolia provided a general overview of APN and its activities in Temperate East Asia. He shared the outcomes of APN's third strategic phrase evaluation and noted that from over 100 projects completed, over 220 peer review articles were published and over 6,700 people engaged. Moreover, APN is engaging policy makers in all stages of APN projects and the evaluation results show that more than 50% of activities involved policy makers in the region to varying extents.

Following the introductions from distinguished speakers, Dr. Linda Anne Stevenson provided an overview of the key objectives and structure of the TEA-SPD.

Keynote speech: Land Use and Climate Change in Temperate East Asia

Dr. Dennis Ojima from Colorado State University gave his keynote speech on Land Use and Climate Change in Temperate East Asia. He emphasised the importance of considering various levels of decision makers from the community level (such as herders) to the international level (such as the United Nations) for effective transformation of scientific information to decision makers.

Some of the main questions in this region, he said, are increasing vulnerabilities due to climate and land use changes and how climate and land use affect social ecological structures and human well-being. In addition, communities are shifting their economic pathways to protect land resources. Studies conducted in Mongolia since 1992 show that, after opening the market, mining exploration and expansion in Gobi and gas exploration in the border areas of Mongolia have had adverse impacts on ecosystems, including water quality and availability, and cultural and economic shifts. For example, changes in employment and opportunities have taken place, and young generations are moving toward industrial employment. This creates an economic and cultural shift and begs the question of the consequences this may have for the natural environment, which are not yet identified. He emphasised the need for cross-scale studies that consider cultural, institutional, and societal factors that influence natural resources and interaction with nature.

Based on his work experience in Temperate East Asia, he noted that populations living in rural areas lack access to adaptive capacity information and infrastructure compared to urban populations. Yet, most urban populations are dependent on services from rural areas such as river basins and pastoral lands. To address this, supporting rural communities and maintaining a sustainable environment by increasing access to social services, is needed. Another key problem is changes in future water availability due to climate change and hydrological stressors and how people are affected. Especially, changes in snow and ice content in the mountain system and its interaction and impact on downstream river systems are not yet well understood for prediction purposes. Therefore, it is critical to consider sustainable river basin management.

Considering these aspects and incorporating them into regional planning for real resilience is a challenging task. Therefore, it is important to have a better understanding of multiple levels of stressors (climate change, water, market volatility, and land use change) and their interaction with social-ecological systems and extreme events, as well as impacts on the landscape. Further, we need to examine the effectiveness of policies and expected benefits to ecosystems and the services they provide. As an example, Mongolia introduced a free agricultural zone in summer 2015. With limited water resources and high rates of evaporation, implementing agricultural land may cause ecosystem imbalance through reduced soil protection, and further affect biodiversity in the eastern part of Mongolia. There are questions unattended that have arisen from such policy implementation, therefore it is vital to have a dialogue with policy makers to inform of these consequences so that there can be a better balance in the sustainable development process.

To effectively address the problems associated with climate and land use there are some methodological considerations such as:

- Enhance stakeholder involvement across a multiple set of decision makers (listen to them, learn from them and provide knowledge to them).
- Perform a system analysis of vulnerability assessment.
- Perform an assessment of adaptive capacity.
- Co-development of adaptation strategies for social-ecological systems in the region;
- Analyse multiple scale decision-making and gain understanding of the organisational structures to facilitate resilience management approaches (governance) across social organisational levels and institutions.

He stressed the importance of understanding the diversity of different communities and ecosystems and that there is no "one-size-fits-all" solution. However, collaborative processes that include enhancing stakeholder involvement and sharing best practices would help all to understand the situation thus leading to better solutions. Global-scale and local-scale issues are changing rapidly including natural, economic and social dynamics, and continuous monitoring and evaluation is a key factor to successfully find solutions. Finally, he stressed three important steps that society needs to act upon. First, climate vulnerability assessment to understand the risks and challenges; second, adaptation planning to integrate climate change into natural resource management; and third, take climate change into account in decision-making.

Session One: Global Change Impacts on Land Degradation and Rural Land Management Changes

Co-Chaired by Dr. Kensuke Fukushi and Prof. Wenjie Dong

Rapid Talk 1: Satellite-based Monitoring of Natural Disasters in Mongolian Socio-ecological System

Prof. Sinkyu Kang, Kangwon National University, Republic of Korea

Prof. Sinkyu Kang noted that land degradation, dust occurrence, drought and Dzud are main disasters that affect socio-ecological systems in Mongolia. "Dzud or Zud" is the Mongolian term for harsh winter weather, which severely impacts livestock and increases mortality rates (Sayed, 2010). These disasters closely or loosely interconnect with each other. Satellite data helps us to understand interlinkages. A satellite-based study that was conducted to understand hydrological changes from 2000 to 2011 has shown surface areas of 73 investigated lakes in Mongolia decreased by 50km^2 per year. Further analysis showed a decreasing trend on the surface area of these lakes. This provides evidence that the Mongolia landscape is drying. Based on his studies, he stressed that there is a need for further analysis to identify other drivers that cause drying landscapes in Mongolia.

Further, Prof. Kang shared the outcomes of a study on Dzud analysis using satellite data. The study examined the effect of livestock numbers with environmental variables such as food availability (using Normalized Difference Vegetation Index (NDVI)), summer temperature, winter temperature, summer precipitation and winter precipitation. The results showed a pattern on livestock dynamics with

environmental factors. For example livestock numbers in the Gobi Desert area vary based on dryness of the area; steppe area livestock numbers are affected based on biomass availability of the forest and, in the northern part of Mongolia, numbers are determined by temperature variation.

He concluded that although remote sensing data provides some macroscale variables for cross-sectoral studies, some phenomena like Dzud and desertification are local- or sub-regional phenomena. He noted that it is vital to have different kinds of ground level studies and local knowledge to understand the relationship between climate variables and local phenomena.

For better understanding on uncertainty, there is a need for long-term cross-scale research that covers different types of spatial scale and considers internal and external drivers and constraints. Further, it is vital to integrate local knowledge, data and practice with sub-regional studies.

Rapid talk 2: Sustainable Land Use Practice in Changing Socio-economic Conditions

Dr. Teiji Watanabe, Global Land Project, Sapporo Nodal Office, Faculty of Environmental Earth Science, Hokkaido University, Japan

Dr. Watanabe emphasised that most factors affecting sustainable land use are complex and transdisciplinary in nature and frequency. Human population directly links to food production and availability, forest management, and other natural resource management. Human population changes affect land use changes and this is one of the socio-economic problems that requires policy makers' attention.

Data on population change in East Asia from 1950 to 2050 shows that, until 2035, the population is expected to increase and from 2050 population is expected to decrease. Taking Russia as an example, the country population peaked at 1992 and has been decreasing since. Japan reached a peak in its population in 2004 (based on Japanese government data) and the population is decreasing while, at the same time, the ageing population is increasing. It is predicted that by 20150, 40% of the Japanese population will be over the age of 65. This will consequently affect both the quality and quantity of the labour as well as forest land management, which currently accounts for 68.5% of land cover in Japan. The Ministry of Land, Infrastructure, Transport and Tourism of Japan has estimated the non-residential area in 2050, the data of which shows that 52.3% of land in Hokkaido will be non-residential. Non-residential areas of Chūgoku and Shikoku will be 24.4% and 26.2%, respectively.

The present scenario in Japan will be observed in other counties in the future and population change will have a clear impact on land use in the future. Therefore, future policy planning should reflect various social and natural factors/drivers that affect land use. In addition, frequency of change in socio-economic data will vary from country to country and policy makers should consider and adapt to these changes accordingly. Possible strategies would be to recruit young scientists or post-doctorate graduates in government policy sectors for effective transformation of scientific data to policy planning and formulation. Encouraging policy makers to become involved in higher education studies in science

will reduce the knowledge gap between science and policy and enhance knowledge transfer among sectors.

Rapid Talk 3: Dynamics and drivers of Land-Use Land-Cover Change (LULCC) and environmental trade-offs for agricultural development in Russia

Dr. Alexander Prishchepov, University of Copenhagen, Denmark

There are many underlying drivers that cause land use and land cover change. Disintegration of state-command systems, open market-economy principles, and new employment opportunities are just some of the drivers that effect abandonment of agricultural land decreased logging intensity, and urban contraction and expansion.

A study conducted in Russia, Ukraine and Kazakhstan shows that nearly 40 million hectares of land in Russia was abandoned in 2010. This land was cropland and grassland in 1990. Eight million hectares of new forests have been created on abandoned land in European Russia between 1985 and 2010. A positive impact of cropland abandonment is that one third of Russia's CO_2 emissions due to industry and fossil fuels are offset by the wild vegetation that grows in abandoned land. The NDVI data analysis in temperate East Europe shows positive trends between 1982 and 2008 towards a greening environment.

Most issues discussed by scientists on land use science are non-linear and each country or region has its own specific or unique problems. For example, the relationship between abandoned land and national agricultural policies - even though the Russian government has provided increasing investment and support for agricultural production, abandoned cropland has been increasing since in 1990. In Belarus, the high level of subsidies for agriculture products has created more abandoned cropland. Azerbaijan shows the opposite trend and increasing the area of cropland with government support has ensured agriculture production for local food security. Therefore, decision makers should consider potentially available cropland among abandoned land and promote re-cultivation to respond to food insecurity. In Russia, nearly 5 million hectares of abandoned can be converted to cropland and provide food security.

Cropland abandonment affects agricultural productivity and food security in many different ways. One example is reduced livestock numbers in Russia due to land abandonment. Between 1988 and 2013, there was a decreasing trend in beef production in Russia. This was offset in the market by importing beef from other countries. 64% of Brazil's meat was exported to Russia in 2014. Such market offsets may be driven by agricultural land issues. Therefore, countries such as Mongolia who depend on livestock production need to carefully consider the underlying drivers of reduced livestock due to land abandonment for future decision-making.

Rapid Talk 4: Environmental Policy including Climate Change and Land Use Legislation

Ms. Munkhzul Chimid-Ochir, Officer, Green Development Policy and Strategic Planning Department, Ministry of Environment, Green Development and Tourism, Mongolia

Ms. Munkhzul's presentation focused on environmental policies and law implemented by Mongolia to address climate change and land use. Presently, Mongolia has five approved policy documents protect the environment. These are: 1) Millennium Development Goals (MDG) Based Comprehensive National Development Strategy of Mongolia No. 12, 2008; 2) National Security Concept No. 48, 2010; 3) State Policy on Ecology No. 106, 1997; 4) Green Development Policy No.47, 2014; and 5) State Policy on Forest No.49, 2015. In addition, 18 national implementation programmes were approved by Mongolia to ensure environmental protection. About 70% implantation of four of these programmes has been completed.

The presenter highlighted Mongolia's national security concept and its five principles to ensure environmental security. The implementation process is expected to be completed by 2030. For climate change mitigation and land degradation, the government aims to mitigate the negative impacts of climate change and desertification, protect and sustainably restore pastureland and educate the public to protect the natural environment.

The government of Mongolia closely considers climate change and available natural resources and resilience in its green development policy, which is the main policy guiding Mongolia towards green development. In addition, MDG-based Comprehensive National Development Strategy has a key area that prioritises climate change. The strategy also promotes capacities and measures on climate change adaptation and protection of the county's ecosystems. Mongolia's "National Action Program on Climate Change" (NAPCC) has five strategic objectives and two implementation phases, which will be completed in 2021. For emissions reduction, there are plans to increase the renewable energy grid to 20% by 2021. Further, fuel consumption for electricity and thermal energy production will be regulated to reduce emissions. Mongolia aims to establish a low carbon economy through introducing environmentally-friendly technologies and improve efficiency and productivity in production and consumption.

Desertification is a major environmental issue in Mongolia and there are three legal documents; Law on Soil Protection and Combating desertification, Law on Forests, and Law on Land in order to prevent further desertification. In addition, the National Action Program on Combating Desertification (NAPCD) aims to cope with and reverse desertification and land degradation in Mongolia. NAPCD also ensures environmental sustainability, improves livelihoods of the rural population and generates environmental services that are of global importance.

In conclusion, she noted that climate change, land use and desertification challenges are closely linked to a variety of sectors including development and economic growth of Mongolia. Asa result, most national development strategies closely consider these environmental challenges. In doing so, the government believes that multiple benefits at all levels exist, including national, regional and international levels. Finally, in order to achieve green development, Mongolia believes that it is essential to cooperate closely with international organisations and other partner countries. Particularly, Mongolia seeks support to implement actions and measures identified in its NAPCC and NAPCD programmes and its Green Development Policy.

Panel Discussion Session

Ms. Bulganmurun Tsevegjav from the Global Green Growth Institute (GGGI) in Mongolia facilitated the panel discussion and the following points were highlighted.

- The Government of Mongolia changed the Ministry of Environment to "Ministry of Environment Green Development, and Tourism" in order to enhance links and synthesise information between the different sectors of environment and development.
- Ministry of Environment, Green Development and Tourism value scientific input and future projections on environmental issues. The ministry maintains close collaboration with national agencies on meteorology and hydrology as well as different academic institutions by implementing joint projects and activities to maintain continued scientific input.
- Finance for local-level adaptation activities are decided by local governments from the central government budget. Therefore, implementation and expenditure differs at the local level.
- As in other countries, Russia faces yield shortages in agricultural productivity. However, a number of investments to increase productivity using advanced technology have been made. In addition, there are ongoing social programmes to raise awareness and promote agricultural production.
- A study has been conducted to analyse evapotranspiration patterns in Mongolia using satellite data and, since 2003 (short-term data), there has been a creasing trend of evapotranspiration in Mongolia. However, without long-term data and analysis it is difficult to predict climate change patterns and long term studies in this region need to be implemented.
- Land use issues interconnect with several sectors and economies; some are international and indirectly affects many countries. For example, if comparing the economic cost of importing beef from South America to Russia with the cost of importing from Mongolia, we can predict the latter costs to be lower. However more detailed examination is needed before reliable results can be provided to decision makers.
- Demographic predictions are more precise compared to climate change predictions, so any integration of those two sectors can only provide estimation on future scenarios. These scenarios are sensitive to policy decision-making and, therefore, any predicted result may change depending on actual situations. Therefore, decision makers should consider the uncertainty of data and adapt policy plans accordingly to minimize impacts, rather than disregarding facts due to uncertainty.
- The impact of national population demographics on land use in Mongolia are not clear. However, at the herders' level, local community migration and ageing are impacting ecosystem land management. Detailed analysis to understand the relationship between sub-national level population change and its impact on land use is important and should be investigated.
- The present analyses of livestock impact with Dzud events in Mongolia only consider the biomass availability without considering quality of biomass or species composition. However species composition is an important factor in livestock production. Indirect analysis such as carbon and nitrogen ratio through satellite data can give an indication of species composition. Although it is a challenging task, if we are able develop a new model to investigate empirical relationships between species composition and remote sensing data it will help to enhance sustainability assessments.
- Lack of proper storage facilities is another factor that affects agriculture productivity. Especially small scale farmers are losing grain quality due to poor storage facilities.

Game Session 01

During the dialogue participants were involved in two participatory games. The games were originally developed by Red Cross Red Crescent Climate Center (http://www.climatecentre.org/) and modified to match the themes of the dialogue. A game of "Dissolving Disasters" was played on the first day, and all participants were divided into two "farming communities" who were requested to take immediate action to a drought or flood disaster forecast. This involved making decisions under uncertainty.

- Group 1 expressed that they adopted a team-based strategy to cope with disaster but the outcome was not as effective as they had predicted. They expressed their understanding of the concept of risk management and the cost implications involved in preparing for a potential disaster. They also noted that some "farmers" tended to make the same decision even when the situation and expected consequences were different. Because of time limitations, the group members felt that group decision-making was not an effective solution.
- Group 2 noted that their decisions were made independently and felt that in an immediate situation an independent decision would provide a more effective response. However, they noted that if the situation was a real-case scenario where the village location was perceived to be safe, then most local people would not opt for protection.
- In one situation, the facilitator used a cone while explaining that the probability of the cone landing on either side was equal. While some of the participants chose to believe/assume this scenario as correct, when one considers the physical structure of the cone, there cannot be an equal probability. This exercise proved to show that good leadership also comes with expert knowledge and would inevitably guide the villagers in the best direction based on skill and experience.
- Preparedness is vital to cope with disaster.
- Some participants explained that their protection decision was based on their experience of where they used to live. Participants who have experience living in drought-prone areas, showed confidence in drought conditions and did not seek protection. On the other hand, they always chose flood protection because of their unfamiliarity in flood situations.
- Although people understand risk, if the cost of protection is too high they will not seek protection. If protection is inexpensive more people will take this option.
- Capacity to interpret and act according to available climate data should be enhanced.

Café Kiosk Session

Café Kiosk 1-Science and Policy

Discussion was led by Dr. Chuluun Togtokh and summary was presented Ms. Zolzaya Enkhtur

Participants of the science and policy kiosk undertook their discussion by responding to three main questions. First, they identified hot spots and critical zones in Temperate East Asia. These included:

1. Dry steppe area of Mongolia - in recent years this area has shown decreased annual rainfall and, with climate change, rainfall may decrease further and these areas will become more vulnerable.

2. Agro-pastoral zones of Inner Mongolia - there is high competition for land use between livestock and agriculture sectors.
3. Wetland areas of North Korea - Land degradation and deforestation are common in this region.
4. Southern and western parts of Mongolia biodiversity loss especially of the decrease in the number of snow leopards and Gobi bears (or *Mazaalei)*
5. Peri-urban areas are vulnerable due to high consumption rates of resources.
6. Melting glaciers in western Mongolia.
7. Coastal areas due to soil erosion and groundwater salinization.

The group then discussed solutions and pathways to improve land management in Peri-urban areas for human and ecosystem well-being. Most Peri-urban problems arise due to tradeoffs and competition for water and land resources. Decision makers are focusing on short term solutions for immediate problems and are not considering strategic solutions for long term solutions in a holistic manner. Further, monitoring and justification is not being followed up on a regular basis.

Group members discussed options for equitable and sustainable use of land, and how to ensure sustainable access to food, water and land for current and future populations. Land ownership is a key issue in land management. Clear and precise legislation and regulations for land ownership should be implemented. Capacity development activities for farmers and the public to identify and resolve land issues are needed. Problems faced during transformation to sustainable development need to be examined and effective transformation strategies need to be identified. The increasing migration of younger generations to urban areas is adversely impacts rural land use management through a reduced workforce. Therefore, a mechanism to control migration to urban areas and increase opportunities in rural areas for younger generations must be considered. Mongolian participants agreed that Mongolia has regulations to address land use issues but these need to be strengthened particularly in light of future climate change projections. However, Mongolia lacks monitoring systems to track implementation and effectiveness of policies. Mongolia's Land Agency should enhance their functioning mechanism and identify potential land for use in the future to alleviate land-related problems.

Comparative studies on costs and benefits between urban and rural living should be undertaken the results need to be shared with the public. This may help reduce future migration from rural to urban areas. Climate change impacts are clearly visible in certain areas of Mongolia and increasing public awareness of climate change might help to reduce future impacts. The Republic Korea government has a number of initiatives that have reduced rural-urban migration. These have been, for example, through free consultations, and financial and technology support for business development in rural areas. The initiatives in Korea have are ongoing and have been successful. These initiatives could also be replicated in other countries in the region. The Overall outcome of resources utilization and decision making needs to be evaluated, in so doing, evaluators responsible for this need to be identified and appointed..

Café Kiosk 2- Knowledge Management

Discussion and reporting were led by Dr. Konstantin Lutaenko

The knowledge management kiosk formed their discussion around three questions: 1) Can knowledge reduce land degradation? 2) How can policy-makers be convinced on best practices for rural management change? and 3) How can knowledge development help improve land degradation in Temperate East Asia? First, the discussion group identified that political willingness and commitment are very important in addressing land use. Two successful approaches shared by participants in this regard included one from China and one from republic of Korea. In China, there is a land planning process every 5 years that identifies functional land in the next 5 years. National policies are very powerful and are better coordinated than local level policies. For engaging international stakeholders there is special office that coordinates national and international efforts. This office also has a network with academic institutions. While the overall process of land management in China is a top down process, there has been successful implementation at the ground level and public awareness on benefits is apparent. In the Republic Korea a presidential decision began a process of greening the environment. With stronger political will and a national-level seed plantation programme that engaged schools helped to transform mountainous land to forest land.

Ethics are important in knowledge management and this was demonstrated by Pope Francis' recently released report on climate change for the general public. A similar situation ensued with the Russian Orthodox Church. The mindset and mind-change of decision makers can be a challenging task, but with the support from religious leaders it can be accomplished. Public outreach and public engagement are other factors in facilitating knowledge to policy makers. In addition to the involvement of religious leaders, international collaboration can help persuade and support national policy formulation. Policy fora, policy briefs and international events for policy makers will lead to more effective sharing of knowledge and best practices their commitment and views. Considering the different governmental structures and regulations, involving foreign relations ministries is also essential to facilitate smooth international communications and avoid misinterpretation of regulations.

Mongolia has effective knowledge-sharing systems among its ministries but this does not reach local levels. General public participation and increased awareness is vital to implement a programme. As an example on raising public awareness, the Republic of Korea has established exhibition areas at beaches to show evidence of climate change. These kinds of initiatives have successfully outreached to the public. Furthermore, demonstrating successful projects to the public tends to increase public participation in these projects in the future. There is a lot of ongoing research and advanced scientific findings related to climate change. What scientists' lack, however, is the ability to translate their findings in a non-technical way that can be readily understood by the general public. To look at solving this problem, one approach is to train scientists may to communicate scientific information to non-scientists. In addition to this, journalists' engagement may also be a crucial factor to transfer the knowledge. Use of local (native) language to deliver scientific outcomes to the general public is also very important and outcomes should be shared in a way that can be understood by end users such as indigenous groups.

Intermediator institutions or organizations that can coordinate information between ministries and science/research institutions is a factor that could be considered in knowledge management in some countries. For example in the Republic of Korea, political will is neutral and, in order to encourage action, intermediate organisations/institutions could play an active role. Currently non-governmental organisations (NGOs) and community-level organisations play significant roles in engaging the public.

The engagement of the same organisations could be vital to enhance public participation in land use management. Finally, participants noted that traditional knowledge plays a crucial role similar to scientific knowledge in knowledge management.

Café Kiosk 3- Communication

Discussion was led by Dr. Ailikun and presented by Mr. Iurii Petrunenko

The communication kiosk focused its discussions on communication interactions between science and policy, why it's important, and what the gaps and solutions are to improve communication between the two. It was noted that communication channels have different levels and multiple scales; including communications with local communities, local governments, national governments and international organisations. It is perceived that most gaps in communication arise due to the unique nature of scientists and policy makers. While scientists follow interest-orientated studies, policy makers' interests tend to be profit-driven. In addition, most of the time, decision-making processes are based on providing short--term solutions for immediate problems. Scientists cannot provide information on immediate issues within the short time frame without conducting the scientific research and providing a full scientific analysis on the issues. Therefore, it is difficult to have consensus between scientist and policy makers. Co-designing and identifying co-products of scientific research may provide more immediate and timely policy-relevant scientific information. Nourishing policy makers with environmental science information that is current may help resolve longer term issues in a sustainable manner.

Media can act as a bridge between science and policy making and there is a need for scientists to engage the media to disseminate their outcomes. Further, engaging high-level politicians in project activities will increase research credibility and be more attractive to the media. Demonstrating regional or international engagement in research activities may also increase credibility and be more attractive to a policy audience. In conclusion, effective communication can only be considered on a case by case. Scientists should be able to adopt effective strategies based on immediate environmental needs and the level of policy makers involved. Experience through trial and error may lead to successful communication.

Daily Media Round-up on Day's Accomplishments

From a journalist perspective, Ms. Zolzaya Enkhtur and Ms. Ariuntuya Ayurzana shared their views on discussions held on the first day. They highlighted the following main points:

- Online/social media is becoming a more popular and powerful tool than traditional media as the rate internet users increases. Scientists and policy makers should consider online media as an additional tool to convey their messages to the public.

- Media attention for research or scientific activities depends on the attractiveness of the topic to the general public, the ownership of the particular issue of interest; and whether action needs to be taken by governments or the private sector.
- Scientists should avoid terms and consider simple terminology to explain research outcomes. Translating research outcomes to local languages will also attract many readers.
- Certain media coverage is sponsor-driven, and journalists often do not have authority to analyse certain issues.
- Scientific capacity development of journalists is vital to present accurate information to the public. Increasing their capacity to understand advanced data collection methods and improve international language skills will improve the quality of information relayed to the public.
- Infographics provide clear understanding to the public than written/text-only materials.
- For better media coverage, activity organizers or researchers should provide an advance press release and agenda for the event in local language. This will increase local media attention. Further, identifying a media spokesperson(s) before the event may help to convey messages clearly to media.
- Mutual trust between media, scientists and policy makers needs to be encouraged and enhanced. Regular communication with journalists will enhance trust.
- Finding suitable journalists to cover research and/or policy activities is a crucial step to deliver accurate outcomes to the public. Establishing a media database in Temperate East Asia region will enhance media outreach by providing science and policy access to journalist/media information.
- Public awareness of climate change and environmental issues vary from individual to individual. Residence (rural or urban), access to internet, financial status, language skills, education level and age are factors that affect public awareness. Therefore, an awareness programme should be designed taking these factors into consideration.

Session Two: Land Use Change and its Impacts on Biodiversity and Ecosystem Services (B&ES)

Co-Chaired by Dr. Tsogtbaatar JAMSRAN and Prof. Alexander STERIN

Rapid Talk 1: Problems of the Russian Far East land use and their biodiversity impacts

Dr. Andrey V. Adrianov, A.V. Zhirmunsky Institute of Marine Biology FEB, Russian Academy of Sciences, Russia

Russia has preserved a vast area of unspoiled and rich natural environment and biodiversity especially in its northern and eastern parts. Almost half of Russia's territory is not burdened by the presence of man and technology; and taiga and tundra areas are the main producers of oxygen. For example, in terms of species richness, the abundance of lichens in Russia accounts for almost 30% of the world's species. Furthermore, half of Russia's territory is mountains with pristine-clean streams running down their slopes. Russia's total forest cover and species richness of its ecosystems provide services that benefit not only Russia but neighboring countries as well. Natural resource areas and population distribution of Russian territory has divided Russia into two main areas: production areas and consumption areas, which are based on supply and demand for ecosystem services.

According to the 4th National Report of the Russian Federation on Biodiversity Conservation (2009), the states of biodiversity and ecosystems in forests have shown that there is a decrease in old-native forest areas within the borders of the taiga zone, which is the zone of coniferous-deciduous and broad-leaf forests. Furthermore, there is an increase secondary forest share (birch and aspen woods); rejuvenation of forests (increase of area of young and ripening forests), especially in bordering regions of Northern-Western, Siberian and Far-Eastern federal okrugs; (due to increased forest as a result of active restoration of abandoned agricultural lands, especially in the non-chernozem area districts).

In the field of conservation and restoration of natural ecosystems: there is growth of lands that were annually disturbed during periods of economic activity and land reclamation; increased fragmentation of natural ecosystems (in tundra, steppe, forest, mountain areas), reduced sustainability due to anthropogenic impacts; and a decrease in steppe natural ecosystems, especially in the European part of Russia. In addition, possibilities for establishment of specially protected areas for protection of steppe vegetation, fauna and chernozems have been reduced.

Dr. Adrianov also shared three cases that shows collaborative efforts between scientists and decision makers in Far East Russia to address biodiversity and ecosystem services.

The Far Eastern leopard is one of the rarest subspecies of the cat family. Due to poaching, habitat distraction, reduced food supply and infrastructure development, habitation areas of the Far Eastern leopard is now limited to the southwestern part of the Primorye Territory. To preserve leopard population, the government established the "Land of the Leopard National Park" in 2012. Further, the

construction of the Narvinsky Tunnel has minimised the disturbance of migration routes of Far Eastern leopards.

Korean pine forests in Far East Russia were heavily logged during the second half of the 20th century and survival of 50 animal species directly depended on the forest area. The endangered Amur tiger was threatened by this decrease in forest area and the Amur tiger population in the Sikhote-Alin dropped to only 30 tigers. The World Wildlife Fund (WWF) data released in 2009 state that harvesting of the tiger had exceeded 2.5-3.7 times the legal amount. Initiated by the Russian government initiated a conservation programme to save the Amur Tiger habitat banned logging of the Korean cedar pine. The success of this programme is shown in the increased Amur Tiger population of 560 in 2015.

The third case of the Khanka Lake, has shown unsuccessful collaboration between scientists and policymakers. Scientific analysis information of water levels of the Khanka Lake in past years were informed to decision makers' who were provided with information that the instability of lake water levels may be problematic in the future. In the summer of 2015, increased water levels caused flooding in the settlement areas and wetlands around the Khanka Lake. At this time, the government sought information from the scientific community on why this happened, however scientists were unable to provide scientific-based information immediately after the flood. Such specific situations affect mutual trust between scientists and decision makers. Therefore, it is vital to build stable and constructive trust between government authorities and scientists on scientific predictions to avoid adverse future impacts.

Rapid Talk 2: Has Land Conversion Policy Conserved B&ES? Evidence from Poyanghu Wetland of China

Dr. Lin Zhen, Deputy Director of Global Land Project Beijing Nodal Office, CHINA

Dr. Zhen's presentation provided evidence on how scientific information guides decision makers for better policy solutions using information from a case study that was conducted in the Poyanhgu Wetland of China. The Poyanghu Wetland is one of the largest freshwater lakes in China and home to 310 species of birds. The lake area changes dramatically from dry to wet seasons and the wetland has been facing flood surges since 1980. A severe flood occurred in 1998. After the 1998 flood, the government initiated a policy of "Returning Farmland to Lake (RFL)" to protect the wetland area. Scientists' were asked to contribute in identifying the reasons for the floods and define risks and flood boundaries. Scientific information provided evidence that the main causes for flooding were linked to deforestation, soil and water erosion, use of natural lake as farmland, urbanisation, and climate change. Flood risk was evaluated and 7110 Km^2 was identified as risk area, which included 223 towns.

Second, she explained an example of how science contributed to the policy implementation process. RFL policy Implementation was designed around two pathways of "complete return" and "partial return". Under the first pathway, the aim was to return specific farmland areas to permanent natural wetland and forbid agriculture. The second pathway of "partial return" turned farmland into seasonal wetland. To identify which pathway would be used in the targeted farmland scientists assessed flood probability and decisions on "partial" or "complete" return of farmland were made based on the results.

Scientists' contribution for the policy impact assessment was explained using comparative studies of land area change and biodiversity assessment. Land area analysis from 1995 to 2005 shows that farmland decreased and wetland area increased after RFL implementation. Habitat quality was assessed using baseline scenarios, conservation scenarios and economic development scenarios, the results of which showed that conservation efforts led to increased biodiversity and improved habitat quality in the region. . Findings from some field surveys show that monitoring and evaluation of RFL are weak in certain areas, leading to partial achievement of targets.

In conclusion, she noted that scientific contribution for decision-making plays a significant role in the success policy-making and implementation. For future policy initiatives, decision makers should consider:

- Integrating impact assessment results into the next phase of policy implementation;
- Considering findings on policy impact assessment, stakeholder participation, ecological security, and regional sustainability during the policy formulation process.
- Identifying clear roles and functions of institutions responsible for wetland protection and maintenance.
- Considering cultural and traditional norms of the communities that living the wetland area
- Identify and compile key data needed for the wetland assessment and build databases that can be easily shared within the country and with the international community as well.

Rapid Talk 3: Land Use/Cover Change (LUCC) in Semi-arid Region of China and its Impacts on Regional Climate

Prof. Weidong Guo, iLEAPS, Nanjing University, CHINA

The semi-arid region in China is highly sensitive to climate change and human disturbance, undergoing significant land use and cover change, causing many problems in Northeast China. There is a stronger relationship between atmosphere and land surface in semi-arid regions. However, at the local level, scientists do not have sufficient knowledge on land surface processes in semi-arid regions due to the nature and limitations of currently available models. To improve the understanding of semi-arid land, in-situ ground data sites were established in the semi-arid zones in China in 2002 and observed data has been recorded over this period.

Prof. Guo shared results of a case study comparing total evapotranspiration and available water budgets between cropland and degraded grassland in the semi-arid Tongyu area in China. The data shows that the annual water budget of cropland is 35%lower than degraded grassland. Based on results, he emphasised that human-induced land use or crop land intensifies water supply stress and further increases aridity in this semi-arid region. From annual data collection, scientists compared inter-annual changes of precipitation and Net Ecosystem Exchange (NEE). The result showed that during the drought period in 2006 and 2007, cropland has less overall NEE compared with grassland. He noted the impact of ecosystem fragility could be reduced by introducing protection measures such as grazing in degraded grassland. Although this study cannot provide highly accurate conclusions, the results show that action to protect grassland may increase ecosystem productivity.

A collaborative effort by six universities developed LUCC maps from 1990 to 2010 to show land type changes in East Asia. The results provided evidence that grassland coverage has changed to other land cover types and also grassland/cropland coverage has exchanged. Data from land surface energy budget, surface temperature and summer precipitation shows that LUCC in the semi-arid region has taken place locally and in neighboring regions as well.

Panel Discussion Session

Prof. Jianlong Li from Nanjing University facilitated the second panel discussion and the following key points were highlighted by participants and speakers:

- Delivering scientific information to decision makers is a challenging task. Scientists more often conduct policy impact assessments based on specific issues and areas, however policy makers like see the whole-system impact perspectives rather than information taken from a few study sites.
- Participation of different stakeholders in policy planning processes are rarely considered yet their involvement in assessment and implementation needs priority.
- Land use changes such as reforestation has not had a critical impact on Far East Area of Russia but has affected Northern Siberia.
- Climate change has significantly impacted marine biodiversity in the Southern part of Far East Russia. Furthermore, marine water temperature has increased by $1^{o}C$ compared to fifty years ago causing an increase in the number of migrating fish and fauna to the area. One third of the total fish & fauna in from the area have migrated from the Yellow and East Seas of China.
- Changes in forest diversity in Far East Russia are mainly driven by anthropogenic activities rather than impacts from climate variability.
- There is no evidence that the biodiversity of terrestrial and water ecosystems in the Northern part of Far East Russia has been impacted by climate change.
- Replication of semi-arid studies in China could be carried out in Mongolia although ground data collection and good levels of collaboration would be needed.
- Similar to other countries, Russia has a mechanism to transfer scientific information to decision makers at the local level. Every year, local governments invite scientists for meetings on nature preservation. Although Russia has established a channel to transfer the information, all recommendations relayed by scientists are not considered by policy makers, although certain recommendations are considered for policy-planning and implementation purposes.
- Changes in agricultural development around the *Khanka* Lake and *Amur River* basin have not been significant in recent years. However, Far East Russia faces river basin and coastal pollution due to the use agricultural chemicals.

Café Kiosk 1-Science and Policy

The discussion was led by Dr. Chuluun Togtokh and the summary was presented by Ms. Sumiya Bilegsaikhan

Participants of the science and policy kiosks discussed the link between economic development and biodiversity, ecosystems, human well-being and sustainable development using the *Kuznets Curve (for*

definition see: http://economics.about.com/cs/economicsglossary/g/kuznets_curve.htm). Participants identified the location of their country in the *Kuznets Curve.* Considering the economic development of Mongolia, it sits at the bottom left of the curve where environmental degradation is considered high. China and Russia are close to the turning point of the curve and Korea and Japan is on the right side of the curve, where society considers environmental improvement. Participants from China felt that, rather than following the Kuznets Curve of economic development, the government should seek another transitional method to economic development that does not sacrifice the natural environment. The process of such a transition may be costly but it would provide more benefit rather than having to wait until optimum economic development (unsustainable development) has been reached before considering environmental protection. Developed countries can assist developing countries to achieve a developed economy by providing advanced and clean technology transfer solutions that allow for sustainable development with low impact on environmental degradation.

Concerning the relationship between economic growth and biodiversity, monetary values cannot be placed on ecosystems. As productions costs cannot consider the monetary value of ecosystem-loss, actual production/economic costs cannot be measured. Sustainable agricultural and tourism have been identified as key sectors that directly connect to sustainable development and economic well-being of future generations. Attempts to limit deforestation in Korea have been successful although measuring against original biodiversity loss is not easy. For this reason, the Kuznets Curve is not useful for precise conclusions in Korea.

Moreover, the group discussed how to improve conservation effort for future generations. For example, the *Amur* region wildlife protection has been threatened by poaching. However, with population migration from rural to urban areas, wildlife protection has improved in recent years. The group also identified that urbanisation or increasing population concentration in smaller areas may reduce pollution levels in rural areas. In the same context, however, declining rural populations present their own set of issues which include maintaining rural environments and traditional culture. Members concluded that there is need for more awareness programmes to enhance public awareness of the indirect effects related to ecosystem development.

Café Kiosk 2- Knowledge Management

The discussion was led and reported by Dr. Konstantin Lutaenko

The main discussion at the knowledge management kiosk was centered on traditional knowledge of indigenous people. Traditional knowledge use differs from country to country and depends on the situation. However, it is accepted that traditional knowledge can guide sustainable development. This said, reflection of traditional knowledge in policy-planning processes is still somewhat low. In Russia, the needs of indigenous communities and their knowledge has led to the establishment of national parks in the Southern part of Far East Russia in order to preserve nature for traditional use and protect biodiversity. The Udege Legend National Park is one initiative by the Russian government to protect and preserve the Udege people and their cultural heritage. Mongolian nomads' ecological knowledge of

pastureland and rangeland management has not been well recognised by local governments for many reasons and, as a result, traditional knowledge and practices are under threat and, in some cases, lost.

Knowledge distribution pathways and actors are different in each country. NGOs and media play an active role in Mongolia; in Russia, the government and partnering organizations contribute in the knowledge distribution process; while in China there is a special authority assigned by local governments for knowledge distribution. This said, the general public lacks knowledge on land use issues. In certain situations, lifestyle changes may be required and introduced if opportunities dissipate in degraded land areas. In such situations, new knowledge and dissemination is vital to introduce new employment opportunities. For example, fishermen may need to consider a livelihood change and become farmers if restrictions were to be placed on fishing. Scientists and decision makers should consider using local language extensively in knowledge distribution especially when targeting ordinary people. Furthermore, emphasis on economic benefits may aid the dissemination and uptake of knowledge among wider communities.

While considering the outcome of local level scientific studies and traditional knowledge, national government should also consider internationally-available knowledge including IPCC reports and IPBES-related assessment information to improve the quality of decision-making. Participants also noted that while scientific research creates knowledge, this is not effectively transferred to decision makers. Therefore, scientists might consider partnering with policy makers and institutions at the project planning stage and establish regular communication channels, which may ultimately lead to better knowledge transfer and informed decision-making.

Café Kiosk 3- Communication

The discussion was led by Dr. Ailikun and the summary was presented by Dr. Suvdantsetseg Balt

The communication group discussed gaps in science-policy communication and identified some suggestions to overcome the gaps. Horizontal linkages among different groups such as natural, social, economic, engineering and information technology (IT) experts are still lacking. Most information is tights within these groups and information is not shared with others. Second, traditional ministry-based communication systems are inefficient and are not able to provide broader information at all policy levels and across policy ministries. Further, the group noted that most policy-making processes are top down in approach and bottom up approaches are not commonly considered. Use of different terminology by each group and different language is another key barrier in communication. Scientific language should be simplified into a common/layman language and, at the same time, scientists need to improve their awareness of societal needs. Translating and delivering outcomes in local languages is a good tool for better communication. In addition, local-level scientific studies require translation to English for global dissemination. Members identified that policies are driven by local needs and science is more focused at the global level. To reduce the barriers provide policy-relevant information, scientists also need to adopt local needs into their research work.

The general media tends to cover “hot topics” that are interesting to society and, to top this, general media tends not to have a good understanding of scientific results. It would be useful if scientists

identified media experts and institutions who can interpret scientific results into layman terms in order to effectively relay the results to policy makers in a form that can be readily understood. Moreover, society has identified the need for multi-disciplinary studies, however current education systems of many countries have yet to adapt education curricula to provide students with opportunities to develop multidisciplinary skill sets.

Trust between science, policy and public sectors is vital for good communication. Providing more accurate scientific evidence will increase trust. Methods of co-designing research with policy makers may also provide better communication. Using new information technologies to reach local communities will increase the flow of information and boost equal access to knowledge. Finally, involvement of think tanks may also reduce the communication gap between scientist and policy makers.

Game Session 02

The game "Paying for predictions" was developed by the Red Cross Red Crescent Climate Center (http://www.climatecentre.org/)and was played at the second game session. The game was used to illustrate the value of seasonal forecasts and the importance of preparedness to minimize the impact of disasters. Participants were divided into 8 groups of 6 members all from different backgrounds, i.e. each group has a mix of scientists, policy makers, young scientists and members of civil society. After the game session, participants were requested to complete the questionnaires and share their feedback.

Analysis of 25 completed questionnaires showed that 84% of participants paid for regional forecasting. Nearly 76% believed that their decision was fully or partially influenced by group members. 96% agreed that they worked collaboratively as a team to cope with disaster preparedness and response. The data showed that participants value early forecasts and find them advantageous. This said, if the forecast had to be paid for and the cost was high, participants preferred to establish a community or regional fund so that the costs could be equally shared, rather than paying as an individual. Further, most participants noted the need to increase the probability of flooding during the game session to stress the importance of protection.

Session Three: Sustainable Land Use Practice for Mitigation and Adaptation

Co-Chairs for the Session: Dr. Koji Kumamaru and Dr. Soojeong Myeong

Rapid Talk 1: Social-ecological Systems and Land Use Change – linkages with SDGs, Adaptation and Mitigation Plans

Dr. Dennis S. Ojima, Colorado State University, USA

Dr. Ojima introduced recent international efforts that unite researchers and decision makers for developing plans for sustainability and managing the risks of global change. Drawing on examples, he highlighted the Sustainable Development Goals (SDGs), UN World Conference on Disaster Risk Reduction (WCDRR), UNFCCC COP21 meeting in Paris, and the recently formed Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) as some remarkable and effective science-policy engagement approaches at the global level in 2015.He stressed that seventeen SDGs identified specific targets that need to be accomplished over the next 15 years and science plays an important role to identify the interconnections between each of the SDGs. he finally mentioned a new research programme, Future Earth, as platform, that aims to provide knowledge to accelerate transformation to a sustainable world. This programme incorporates many of the core and joint programmes of the three traditional core programmes of global environmental change, namely IHDP, IGBP and DIVERSITAS.

Dr. Ojima shared the results of a case study that was conducted in Mongolia on herders and the status of their livelihoods under a changing climate. Herder demographic studies from 2001 to 2011 showed a decreasing trend in the number of herders and increasing aging population due to the migration of young herders. The numbers had dropped by about one-quarter of the total number of herders in Bayankhongor and Uvurkhangai, and the number of young herders has decreased by one-third. The study identified local strategies that could be incorporated to protect pastoral systems and herders' livelihoods. Some strategies included drought management or taking preventative knowledge-based decisions during a period of drought to cope with Dzud; restoration of traditional pastoral land use patterns (cultural landscapes); cooperation among herders and other stakeholders; and improvement of the education of herders, including traditional knowledge. Moreover, the project identified possible government responses that may help improve herders' livelihoods and their associated landscapes. Enabling herder participation in local and regional water and natural resource planning s, utilising local institutions such as 'One River Communities' or River Basin Communities are some of the recommendations made in the case study.

Rapid Talk 2: Climate Change, Grassland Degradation and Adaptive Management Strategies of Livestock Production

Prof. Xiangzheng Deng, Center for Chinese Agricultural Policy, CHINA

Prof. Deng noted that, according to the fourth IPCC assessment report, slight warming or lower than $2^{o}C$ variation will cause grassland degradation by about 15%. Further global warming would cause more

extreme weather events and which would affect livestock production. Therefore, it is important to examine the interconnections between climate change, grassland production, livestock production, herders' income and adaptation options. An integrated study that was conducted in Qinghai, China shows that the NDVI of grassland has a nonlinear variation with temperature and is linearly associated with changes in precipitation. Further, Net Primary Production (NPP) analysis of the Qinghai area shows that while temperature has a marginal effect on NPP, the effect on precipitation is significant. Though there is an increasing trend of temperature rise, this does not indicate a significant impact in itself. Temperature fluctuations have a high impact on grassland ecosystems. Comparative studies of grassland quality and breeding stock have shown that if grassland quality is improved by 1%, breeding stock will increase by 2.9%.

The impact of temperature on breeding stock is significant and household income is positively associated with breeding stock. A 1% increase in annual mean temperature (i.e. 0.04~0.05^{o}C) will decrease breeding stock by 1%. In addition, if there is an annual mean temperature rise by 1^{o}C, herders' income decreases by 0.18%. On the other hand, if the annual mean precipitation increases by 1 mm, herders' income increases by 0.06%. Based on the results of the case study, livestock production is affected by climate change and effective adaptation options are needed for sustainable development of livestock.

While some human activities and adaptation options contributed to conserving grassland ecosystem and increased herders' income, it is still necessary to reinforce more adaptation measures to further promote sustainable development of livestock production, increase herders' income and livelihood. The case study evaluated available adaptation options followed by government and herders. He noted too that an institutional arrangement at the national level is the top most priority in Qinghai area for effective adaptation. The introduction of new technologies for improving ecosystem services was identified as a medium-level priority and grassland protection and adaptive measures for herders' was identified a bottom-level priority. Yet, there is an urgent need to improve the performance evaluation of implemented adaptation measures such as scenario analysis and holistic impact assessment of climate change on socio-economic systems under different kinds of adaptation options.

Grazing capacity is highly sensitive to climate change. Therefore, the conservation of grazing capacity needs reinforcement and adaptive intervention mechanisms need to be formulated in response to climate change. Apart from climate factors, grassland sustainability closely interconnects with increasing meat demand and land use intensity for infrastructure development. Finally, Prof. Deng concluded that involvement of and collaboration with different stakeholders are vital to protect grassland systems and adaptation options need to be mainstreamed to cope with the impacts of climate change.

Rapid Talk 3. Innovative Adaptation of Pastoral Systems in Mongolia

Dr. Chuluun Togtokh, Dryland Sustainability Institute (DSI), MONGOLIA

Dr. Togtokh discussed an ongoing co-designed project involving different stakeholders from universities, the private sector, international donors, governments and herders. The project aims to predict the winter-spring carrying capacity based on summer drought conditions as well as predict changes in livestock numbers. Based on the 2015 summer analysis, the project identified four areas that will

require different adaptive measures to cope with winter conditions based on the vulnerability of these areas. These predictions will help herders to plan movement of livestock and to prepare adequate fodder for the winter period.

The ecological vulnerability of Mongolia has been increasing since 1990 when Mongolia shifted to a market economy. While 6 provinces (*Aimag*) were vulnerable out of the 21 provinces from 1970 to 1990, from 1991 to 2008 this number increased to 15 provinces. Since introducing a market economy, livestock numbers and carrying capacity has been increasing and, as a result, grassland degradation has increased. Further, social-ecological vulnerability is increasing in Mongolia and early prediction and implementation of adaptation options are essential to reduce impacts.

A research study in Tuul River basin shows that permafrost melting has been increasing since 1970 and river flow rate has been decreasing. Therefore, reduced water availability will impact livestock production and human well-being of Mongolia. An economic analysis using Computational General Equilibrium model for livestock industry shows that, if the price of meat doubles, the Gross Domestic Product (GDP) of Mongolia can increase by 5.6%. A triple increase in price will result in an 11.8% GDP growth. This analysis shows it is vital to improve the quality of meat production and reduce livestock loss due to Dzud. Developing a meat storage system (Freezer Storage Technology) powered by solar energy is an adaptation option that is being implemented through private sector partnership in a pilot site implemented in the Ovor Zaisan Research Center in Mongolia. The project aims to improve the livelihood of herders without adversely impacting the traditional nomadic culture and the environment.

Panel Discussion Session

Dr. Enkhtuya Oidov from the Nature Conservancy of Mongolia facilitated the panel discussion on sustainable land use practice for mitigation and adaptation. The following key points were highlighted:

- Fodder availability in Mongolia differs from area to area and before the economic transition herders did not face difficulty finding fodder for livestock. Recently, however, several regions especially close to the Gobi desert are facing difficulty to secure adequate fodder. At the herders' level there are some initiatives to cope with decreasing fodder such as movement of livestock to escape severe weather conditions, buying hay, and producing more hay close to the mountain forest. However, there is limited attention paid by Mongolian scientists and policy makers to increase fodder resources.
- Animal health and sanitation issues are common in livestock production but there is high potential to reduce the risk in near future with ongoing initiatives.
- The research initiative, Future Earth, is trying to collaborate with regional networks and local institutions to connect local researchers and their findings with international assessment reports. As SDG assessments are focused at local and regional levels, more opportunities will be available for local researchers to develop knowledge through contributions to assessment studies.

Café Kiosk 1-Science and Policy

The discussion was led by Dr. Chuluun Togtokh and presented by Mr. Hideyuki Mohri

The group discussed technologies that can provide viable solutions for sustainable land use practices. Further, in a changing climate it is critical to have accurate predictions. Satellite and remote sensing data are frequently-used technologies to understand land cover change. To promote better understanding of land use issues, access to technology and data sharing needs to be enhanced. Advanced early warning systems are another key to protect livelihoods and identify mitigation and adaptation options. Further improving soft knowledge to understand causes and effects of land use change are vital to promote mitigation and adaptation actions. Participants noted that technology transfer should be coupled with knowledge transfer and capacity development for better usage and understanding. Energy technologies are closely connected with land use such as land use for bioenergy production and increasing use of wood as a fuel. Enhancing energy technologies would reduce potential land degradation.

Collaboration is key to achieve sustainability and it is vital to promote collaboration among different disciplines at the university level and expand this collaboration to regional scales. For example, partnership initiatives among universities in Russia, China, and Japan using national-level resources have led to effective implementation of regional studies. Participants also agreed that the Future Earth initiative of co-designing may help strengthen the collaboration among researchers. Finally, linking science and policy initiatives to the public can be achieved by involving the young generation because of their wider exposure.

Café Kiosk 2- Knowledge Management

The discussion was led and reported by Dr. Konstantin Lutaenko

The third kiosk session on knowledge management focused on knowledge dissemination pathways. Similar to other sessions, participants identified media as a key factor in the dissemination process. However, special training for journalists is required for correct interpretation of scientific results. Showcasing best practices is an effective dissemination tool to reach the general public. Several countries have successfully promoted the concept of ecotourism through displaying best practices. NGOs were identified as another actor in knowledge dissemination, however, based on some country regulations NGOs cannot contribute to the dissemination process at the same level. For example, Russian NGOs have limited access to international funds due to new laws and regulations. The lack of financial support has resulted in reduced NGO activities in Russia. Extension services play an essential role among rural communities in knowledge transfer especially in the area of technical knowledge transfer and skill development.

Although scientists understand the importance of knowledge transfer, they prioritise high-level peer journal publications for transferring information. To improve the knowledge transfer to the public and decision makers, scientists should provide additional services to enhance the flow of knowledge. Perhaps, an incentive of some kind is needed here from governments to promote the flow of information. Further formulating their research in a more pragmatic way may benefit the general public and enhance knowledge transformation.

Using new technology to educate the public is an effective tool for knowledge dissemination. For example, transferring weather information via mobile SMS services has been an effective tool to provide advanced information on extreme event in Mongolian herder communities. Therefore, using new technologies will enhance knowledge transfer to the general public.

Café Kiosk 3- Communication

The discussion was led by Dr. Ailikun and the summary was presented by Mr. Chao Wang.

The communication kiosk discussed the importance of the media; however, due to lack of confidence among scientists, the group emphasized the need for specially trained professionals for communication. Formulating information for decision makers using political language and for public using public language is critical to attract the attention of these stakeholders. Building a new communication framework between science, policy makers and stakeholders is an initiative that has been taken up by European countries to enhance communication among the various sectors. However, such a network does not exist (yet) in Asia. Establishing such a network in Asia will promote cross communication of information and better understanding.

The group identified the need to integrate individual scientific observations and examine issues in a more interdisciplinary manner to convince stakeholders to consider policy-relevant science. The group again stressed the importance of training journalist to improve communication. Civil-journalist play a main role in mainstreaming information to the public and their involvement has become critical for future communication and transfer of information on environmental problems. Finally, members noted that popularising science among the public is a challenging task and scientists need to grasp this aspect and make it more interesting by showing clearly how science can be policy-relevant for the betterment of the people.

Daily Media Round-up on Day's Accomplishments

Ms. Ariuntuya Ayurzana stressed the importance of a media communication strategic plan for science and institutional activities. First, identifying short- and long-term plans and what kind of information needs to be distributed to the public. Using mass communication to reach a wider audience requires careful planning and the involvement of different stakeholders.

The discussion frequently talked about co-designing, co-production and implementation. When integrating all sectors into one study, mass communication should also be factored in the process. Further, having panel discussions involving different stakeholders and Identifying important factors simultaneously will lower costs and enhance understanding among the stakeholders. The group also highly recommends that an interview not refrain from responding to media questions unless they are absolutely clear and certain on specific facts. When revealing accurate scientific findings to the general public, scientists should also correlate these findings with human issues and social impacts. This will help attract more attention.

Ms. Zolzaya Enkhtur noted that scientists tend to use scientific equations, complicated graphs and computer-generated model graphics to explain climate phenomena. This kind of language cannot be conveyed to the public as these concepts can only be understood by the trained scientific eye. The language of science could be interpreted by engaging artists, designers, producers and journalists to convey the results via modes/messaged that the public can understand. Media pays more attention to the conclusion of the scientific studies than the methodology and results of the science itself. Scientists should pay more attention to conclusions of their work in conveying the impacts to policy and the general public. Scientists are skeptic of the media and their ability to misinterpret science results and provide misleading information. To overcome this particular problem, scientists should consider undertaking courses in civil journalism allowing them to provide their conclusions directly to the public through their own articles. One obstacle here is that this is not yet popular and is, therefore not an immediate solution. Another potential solution discussed by the group was to involve a team of journalists and use their individual capabilities and scientific knowledge in a combined effort to convey more understandable and accurate messages to the public.

Session Four: Briefing Outcome of the Dialogue

Co-Chairs for the session: Mr. Bayarbat Dashzeveg and Dr. Linda Anne Stevenson

Sharing thoughts by Kiosk Leaders

During the dialogue, three cafe kiosk sessions on science and policy, knowledge management and communication were conducted. Participants rotated to each of the kiosks throughout the meeting so that they could cross-fertilise their ideas with other groups. Participants were able to meet and have active conversation with the kiosk leaders and their respective group members. At the end of the sessions the facilitator summarised the main and shared with the plenary.

Science and Policy Kiosk

Dr. Chuluun presented a summary of discussions at the science-policy kiosks and stressed the importance of identifying and conserving hotspots and critical zones in Temperate East Asia. Peri-urban areas were identified as vulnerable due to competition for land and water and the need for trade-offs to ensure balance. In some countries such as Mongolia, urban development planning and land use planning are not integrated this causes more ineffective land management. Mongolia's Eastern steppe is another critical zone due to its unique biodiversity richness and impacts of Land Use policy on ecosystem. To preserve critical zones, participants identified that regular monitoring, evaluation and justification are needed to implement policies and take action. Further conservation efforts need to be enhanced, for example, establishing national parks in Peri-urban areas will maintain some kind of ecosystem balance.

Clear land ownerships and stronger regulations are vital to protect land resources. Implementing monitoring systems and enhanced effectiveness of law and regulations on land ownership is vital. Capacity development and educating the public for resilience is another action that will help achieve land sustainability. Rural migration of youth to urban areas is common for both developed and developing countries. To reverse migration as provide better management of rural landscapes, financial and technological supports for rural communities are needed.

On issues related to land-water-food nexus the question was raised decision-making and whether decisions are made by local communities and/or government? Most participants agreed that participatory approaches are essential and provide common values to all stakeholders. Discussion on the *Kuznets curve* provided some understanding on pathways that China, Russia and Mongolia can take to achieve sustainable development. Moreover, adding economic value to ecosystem services will promote conservation efforts. Integrating nature and culture conservation into sustainable development planning will protect the environment while achieving economic development.

Knowledge Management

Dr. Lutaenko briefed on the outcomes of three kiosk sessions on knowledge management. He noted that during all three sessions, participants were not able to distinguish the difference between knowledge distribution and communication. For this reason, information from the communication knowledge kiosks were very similar.

Participants identified several knowledge distribution pathways, highlighting 2 in particular: 1) Informing policy makers' decisions to the general public; and 2) Transferring information on public needs to decision makers. Temperate East Asia has different decision-making approaches to resolve land use issues. Initiatives in China and Russia are top-down and in Mongolia, Japan and Korea, initiatives are mostly bottom-up. In Mongolia, NGOs funded by international organisations play an active role in land use and climate change issues. China has a unique and stronger government approach for knowledge management through special extension services at different levels of government.

Traditional knowledge was emphasised as a key factor in knowledge management and distribution. The Russian government initiative to preserve indigenous communities and their knowledge through creating national parks was highlighted as a best practice. Mongolian traditional knowledge has been under-used and certain knowledge has been lost. Members agreed that traditional knowledge is vital for successful land management and this knowledge has to be preserved. Further, local language was a key factor considered in the effective transfer of scientific information to the public. In addition, effective knowledge management and transfer could also clearly show economic benefits of policy-relevant science and attract more people.

Scientists have to consider different and more attractive approaches to attract the attention of decision makers. Traditional approaches of producing journal articles are only intended for and attractive to science audiences. The role of media was recognised as a key factor in knowledge dissemination and their involvement is essential convey information to the general public. Knowledge management is a collaborative process and participation from different stakeholders is fundamental to achieve sustainable development.

Communication

Prof. Ailikun noted that during the kiosks sessions she tried to identify perspectives of communication in a science-policy context, why it is important and what actions are needed to improve communication between science and policy communities. Most communication barriers are due to the different nature and different scope of science and policy sectors. The use of different terminology and language is a key communication barrier among the two stakeholders. This is further exacerbated by the fact that scientists come from different disciplines. Scientists' work usually focuses on topics of personal interest, while decision makers are solutions driven for the socio-economic needs of the country. Mismatches in timescale between scientists and decision makers are another factor that leads to miscommunication. While commonly addressed these days, the kiosk stressed again the adage of scientists requiring 3 to 5 years to present science-based solutions, while decision makers need weeks to months make decisions on the same issues. Further iterated that if scientists are producing information for policy formulation, these scientists need a better understanding of the different levels of policy-making processes. At the same time, scientists need to observe and relay the social, cultural and economic impacts to a particular problem in addition to the environmental impact factor.

Participants identified possible solutions to overcome barriers and enhance communication:

- Scientists and policy makers should consider co-design and co-production

- More local-level science needs to be undertaken.
- Selecting people/institutions that have communication transfer capabilities will lead to better knowledge transfer.
- Using communicators/mediators/translators' expertise to translate science to common language translate English local language and translate local language to globally-used English language will effectively bridge gaps in knowledge transfer and provide more effective communication channels.
- Maintaining the credibility of science via producing quality results will help to build trust
- Conducting local level science will also build trust with local communities
- Conducting interdisciplinary and applied scientific studies may be a more convincing approach for decision makers to understand the relevance of the science and find appropriate solutions. Capacity development is an important step to enhance communication, for example Training policy makers to understand and use scientific findings in policy formulation.
- Capacity development and training for media may also be a good solution that provides a mediator for science and policy discussions.
- New technologies will help increase the quality and efficiency of communication and outreach to wider audiences. The complexity of decision-making processes and political systems cannot be precisely judged based on theories, in addition to the fact that they often differ from country to country. In this light, the approach of learning--by-doing may be a good approach.

Finally members discussed future approaches to enhance communication. Establishing regional/local communication schemes for sustainability research and sharing the successful cases and best practices was considered as a good approach. Introducing interdisciplinary and transdisciplinary studies to young scientists at the undergraduate level will promote trans-disciplinary communication in the future and more effective knowledge transfer. More involvement in global initiatives such as Future Earth may help achieve global-level communication.

Sharing Thoughts by APN Member Country Representatives

APN members shared their views on what they learned from the dialogue and presented ideas to promote better science-policy interactions.

Dr. Wenjie Dong, Scientific Planning Group Member of China

The SPD provided a platform to learn from senior scientists and policy makers as well as share knowledge and best practices among countries in the sub-region. Involving young scientists provides them with a valuable opportunity to understand how science and policy connects and this will be useful for their science careers.

Dr. Koji Kumamaru, Japan nFP alternate

The dialogue was a unique platform to learn and understand barriers to successful science and policy linkages. The Poyanhgu wetland study in China gave a clear overview of how scientific knowledge and data contributed to policy formulation, implementation and evaluation. The kiosk sessions identified the need for capacity development of both policy makers and scientists to understand the unique

differences in the operations of science and policy and how to better formulate information to satisfy the needs and understand of each party. Engaging young Ph.D. graduates in policy planning processes may provide better solutions to effectively utilise scientific knowledge. The Japan National Adaptation Plan draws on knowledge and expertise by engaging experts from seven main categories that are engaged in addressing climate change impact assessments using current climate change information, climate issues in Japan, and future predicted impacts on each sector. Based on the results of the assessment, the National Adaptation Plan was drafted and is now open to the general public for comments. As a part of the plan, the Ministry of Environment is helping developing countries to develop their own National Adaptation Plans and, presently, Japan provides expert knowledge to the Government of Mongolia.

Mr. Bayarbat Dashzeveg, national Focal Point of Mongolia

The SPD has helped me to understand common issues among countries in Temperate East Asia. Further, everyone understands that there are gaps in the communication between scientists and policymakers. Regular dialogues will be an effective means to reducing these gaps. Using simple language is vital when scientists deliver outcomes to policy makers and the public. Most policy makers pay attention to the scientific conclusions and, therefore, these conclusion need to be expressed simply for better understanding to non-science communities including policy makers and the public.

Dr. Soojeong Myeong, Scientific Planning Group Member of Republic of Korea

To minimise the adverse effects of global change issues, knowing the benefit of knowledge, policy implications and capacity to act at the ground level are vital. APN as a regional network supports all of these stages; therefore it is vital to strengthen the activities of APN in the region. Based on the dialogue discussions as well as from the experience of reviewing annual proposals submitted to the APN, I see similarities in issues that are faced by countries in the region. Therefore, sharing knowledge and best practices and replicating efforts will provide economical approaches to the region to cope with climate issues. The members of the science and policy kiosks pointed out the need for shortcuts to achieve sustainable development. I believe regular dialogues similar to the present dialogue will help us understand possible options that will help us reach sustainable development.

Dr. Andrey V. Adrianov, national Focal Point of Russian Federation

The dialogue gave an opportunity to participants to share their experiences, successful stories, identify gaps and suggest solutions to overcome global change issues. Involvement of young scientists will strengthen future communication of science-policy. Decision makers and scientists have different views when it comes to analyzing the economic value and environmental value in certain issues. However, enhancing the understanding of these differences will help effective decision-making towards the sustainability. Though countries have similarities, they follow slightly different approaches to resolving the issues; therefore, all participants need to understand the uniqueness of each country and its approaches while acknowledging regional efforts. I appreciate APN efforts to bring scientists and policy makers together in one platform.

Sharing thoughts "Voices of Youth"

Based on suggestions from a previous dialogue, a group of young scientists from all countries in the sub-region attended the dialogue, learned from the experience and shared their own thoughts on how science can contribute to policy planning in the future:

Group I

First, we are very glad to hear the suggestion on utilising young Ph.D. graduate expertise in the policy sector to improve communications among science and policy. This encourages us and promotes better use of knowledge toward action. We understood that many collaborative efforts are going on and collaboration among scientists from different countries will help identify pragmatic approaches to resolving local and regional issues. Further, we believe that enhancing data sharing at all levels will improve the analysis and understanding of local and regional level issues. Most global level data is available for public access, but there is a lack of data availability at local levels. If we are to consider interconnections of local and regional phenomena, it is vital to improve access to local level data.

Group II

Climate change is a complex issue and affects different disciplines and stakeholders around the world. Mitigation actions towards climate change are global-level efforts, and adaptation actions are local level. Therefore, to address climate change in a sustainable manner, collaboration and communication among all stakeholders is vital. Transdisciplinary and interdisciplinary approaches will enhance action, however, the actions or solutions should also consider co-design with multi-stakeholders. Considering the diverse nature of scientists and policy makers, a problem-oriented approach may help to reduce the gap between policy makers and scientists.

Action for sustainable land use practice can be generated from combinations of knowledge and capacities that exist at global, regional and local levels, considering local conditions. A network of academic institutions between Temperate East Asia countries would promote information sharing among the next generation and also help to understand bordering countries' issues. Finally, the members from our group would like to end by stressing that the involvement of science and policy should continue at the planning and implementation stages. Mostly, the commitment of policy makers is essential to promote action towards resolving the impacts of global climate change.

Group III

As young scientists, we were impressed with the examples presented at the SPD and we learned that successful collaborative efforts of scientists and policy makers are needed to resolve local and national issues. The SPD provided us with insightful thoughts to develop our professional careers and further improve our science contributions for future decision making. We also believe that media is an important player in science and policy communications as well as in raising awareness of climate change issues to the general public. We expect media to be capable of delivering neutral and accurate messages to policy makers, stakeholders and the public without any bias.

Group IV

We would like to share three key messages on future science and policy engagement. The first is that scientists should work hand-in-hand with policy makers to resolve climate change issues. Although this is a difficult task, understanding the problems and being open to the ideas of other scientists will allow us to better and more effectively address climate issues. We also feel that professional knowledge is critical and important for solution-oriented approaches to climate change and, in this context, transparent and reliable approaches need to be undertaken. Third and finally, we have to say that all young scientists' groups were motivated to engage in the dialogue discussion and to understand the importance and for collaboration of different disciplines and to act as a team to resolve climate change issues.

Roundtable Dialogue

Each dialogue participant received one minute to provide their remarks on the way forward for two-way approaches to better science-policy engagement. Key messages were:

- Communication gaps among scientists, policy makers and the public was identified as a key issue. New communication tools such as blog writing and social media may help to reduce the gaps. However, quality of the data that is shared through those media channels needs to be evaluated first.
- The dialogue provided an overview of issues that scientists need to further investigate for a better understanding and to explore possible solutions. The need for advanced technologies to help developing countries to address climate issues was also an important factor that was highlighted.
- Exchanging views was an important part of the dialogue and every participant needs to understand his/her own responsibility for better science and policy linkages.
- The dialogue was a platform to share opinions on soft skills development to address climate change.
- Scientific knowledge does not automatically attract policy makers. For this reason, scientists should provide evidence-based science to attract decision makers.
- All aspects on any issue should be studied in detail by scientists. Then, only selected information from the results should be carefully considered for delivery to policy makers, particularly the information that is most relevant for decision-making. For example, for scenario analysis, three scenarios that are most relevant for decision-making would be sufficient for decision makers.
- Air-quality is a critical issue in China and the government is trying to promote innovative technologies and renewable energy to improve the quality of air. However, further studies on technology innovation will help decision makers overcome these climate-related issues.
- Capacity development of scientists and decision makers is a fundamental requirement for better communication.
- Learning from best practices provides a pragmatic pathway for policy makers to understand and improve the policy implementation process.
- Communication gaps between scientists and policy makers has become an international issue. To improve communication, scientists should identify the correct decision makers and

implementers in response to a specific issue. Further, scientists should understand the decision making process and need to work with decision makers at the beginning of the process rather than waiting to suggest changes at the final stage.

- High impact journal publications do not provide information to the general public and policy makers, and scientists need to follow other alternative communication tools that will be understood by the public and decision makers.
- To reduce gaps between science and policy, regular dialogues among scientists and decision makers are vital.
- Making an impact from implemented policies is a demanding task, therefore, for future dialogues, it is necessary to involve different ministries that are responsible for policy implementation.
- Scientific knowledge is growing faster but does not reach decision makers and the public in a similar way. Therefore, media participation in knowledge transfer needs to be further strengthened.
- Scientists need to use their knowledge and data effectively to answer societal problems and to promote public engagement in climate change.
- Future Earth approach will help to integrate local knowledge at the global level. The role of regional networks like the APN is vital to strengthen the connection between local and regional efforts with global efforts.
- Young scientists equally contributed to the dialogue with senior scientists and policy makers. This is a positive indication for future success on scientific evidence-based decision making. Further it provided an overview of complexity of the decision-making process for young scientists. Therefore, their involvement in regional and local dialogues should be promoted for future sustainability.
- Research needs to be designed based on end user and stakeholders' requirements and keeping them engaged in the process will be useful for successful implementation of relevant research outputs.
- In earlier years, science was evaluated through a science peer process, but modern science is evaluated by society. New science needs to focus on societal needs and involve different levels of stakeholders.
- Stronger policies are needed improve sustainable land use practices. Mongolia has policies to address the issues but do not have an effective implementation process. There is a need for national-level dialogues to enhance understanding and promote policy implementation processes towards sustainability.
- Scientists could represent the environment and its ecology in the policy-planning process. They are responsible for emphasising the importance of conserving environment for the future of the world.
- Scientists and decision makers need to maintain an open mind and welcome new ideas for better linkages between science and policy.
- Networking opportunities through the kiosks and game sessions created a friendly environment for participants to engage and share their opinions.

Media Round-up

Political instability of a country limits actions towards sustainability. Especially, frequent changes of administrative structures create more difficult situations for transferring knowledge and information to relevant authorities. In certain situations, it restricts media activity and their voices. Media freedom should be promoted in all areas to increase public awareness.

Training journalists is vital to understand complex science; however scientists should be able to identify correct journalists to convey their message to the public. In addition, scientists may need to categorise their outcomes based on relevancy to end users. Essential information should be shared with the media to allow media to disseminate to the general public.

Decision makers often do not have the time to attend science-policy dialogues and, therefore, scientists and media can think of having dialogue first, identifying appropriate information and deliver this to decision makers.

Closing Remarks

Mr. Hiroshi Tsujihara, APN Secretariat Director shared his views on science-policy interaction. He stated that APN is a unique network that aims to connect science and policy. As a result, scientists and policy makers from five countries in Temperate East Asia gathered in Mongolia and shared their knowledge, experience and best practices. He noted that cooperation between science and policy cannot be attained within a short period and it will gradually increase with time through cooperation. From his experience as a former policy maker in the Ministry of Environment Japan, he noted that science-based policy formulation needs more time to create a common understanding among ministries. However, scientific information can help to promote the process of making common understanding inside the government. Thus, it is essential to continue the communication between scientists and policy makers.

Mr. Tsujihara acknowledged the support from the Ministry of Environment, Green Development and Tourism of Mongolia and the Institute for Sustainable Development for their support to hold the dialogue in Mongolia. Finally, he thanked all participants for their active participation in the dialogue and Government of China who will host the next APN Intergovernmental Meeting in Henan province in China next spring.

Mr. Bayarbat, the APN National Focal Point for Mongolia, conveyed his appreciation to APN Members of Temperate East Asia and all participants for their active participation in the third Science-Policy Dialogue.

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Appendix 01-Agenda of the Dialogue

Third APN Science-Policy Dialogue on Global Environmental Change: "Land Use and Climate Change in Temperate East Asia"

02-05 November 2015, Ulaanbaatar, Mongolia

Venue: Chinggis Khaan Hotel, Tokyo Street 10, Ulaanbaatar 49, Mongolia

DAY ONE: 02 November 2015	
Registration	
08:30-09:00	**Registration of delegates and invitees.** *All delegates are kindly asked to be seated by 9:00am for the official opening of the Science-Policy Dialogue.*
Opening Session	
09:00-09:10	**Welcome Remarks** *Mr. Bayarbat Dashzeveg, APN national Focal Point for Mongolia, on behalf of Ministry of Environment, Green Development and Tourism, MONGOLIA*
09:10-09:20	**Welcome Remarks** *Mr M. Khurelsukh, Vice Minister, Ministry of Environment, Green Development and Tourism, MONGOLIA*
09:20-09:30	**Welcome Remarks** *Mr. Hiroshi Tsujihara, Director, APN Secretariat*
09:30-09:45	**General introduction on APN** *Dr. Tsogtbaatar Jamsran, APN SPG Member for MONGOLIA*
09:45-09:55	**Setting the Scene – Roles and Objectives** *Dr. Linda Anne Stevenson, APN Secretariat*
09:55-10:10	**Participants Self Introduction** *Facilitated by Dr. Linda Anne Stevenson, APN Secretariat*
10:10-10:30	**Keynote speech: Land Use and Climate Change in Temperate East Asia** *Dr. Dennis Ojima, Colorado State University, USA*
10:30-11:00	***Group Photo and Refreshments*** *All participants have a group photograph taken before the refreshments*
Session One: Global Change Impacts on Land Degradation and Rural Land Management	

Changes			
Co-Chairs for the session: Dr. Kensuke FUKUSHI and Prof. Wenjie DONG			
11:10-11:50	**Rapid Talks**		
	1. Satellite-based Monitoring of Natural Disasters in Mongolian Socio-ecological System *Prof. Sinkyu Kang, Kangwon National University, REPUBLIC OF KOREA*		
	2. Sustainable Land Use Practice in Changing Socio-economic Conditions *Dr. Teiji Watanabe, Global Land Project, Hokkaido University, JAPAN*		
	3. Dynamics and drivers of LULCC and environmental trade-offs for agricultural development in Russia *Dr. Alexander Prishchepov, University of Copenhagen, DENMARK*		
	4. Challenges in Policy Formulation and Implementation in Land Use Changes *Ms. Ch. Munkhzul, Department of Green Development Policy and Strategic Planning, Ministry of Environment, Green Development and Tourism, MONGOLIA*		
11:50-12:30	**Panel Discussion Session**		
	Facilitator: Ms. Bulganmurun Tsevegjav Panellist 1: Prof. Sinkyu Kang Panellist 2: Dr. Teiji Watanabe Panellist 3: Ms. Ch. Munkhzul Panellist 4: Dr. Alexander Prishchepov		
12:30-13:30	***Lunch***		
13:30-15:00	**Participatory Games: Full details will be provided during the SPD.**		
15:00-15:15	***Refreshments***		
15:15-16:15	**Knowledge-Sharing Café Kiosk**		
	Café Kiosk 1 – Science & Policy Led by Dr. Chuluun Togtokh	Café Kiosk 2 – Knowledge Management Led by Dr. Konstantin Lutaenko	Café Kiosk 3 - Communication Led by Dr. Ailikun
16:15-17:15	**Roundtable Discussion on Kiosk Outputs** Led by Co-Chairs for the session with summaries from each Kiosk session		

	(A representative from each Kiosk team will have 10 minutes to provide a brief summary of the outcomes)
17:15-17:30	**Daily Media Round-up on Day's Accomplishments** Led by Co-Chairs for the session with perspectives from Media participants
	HOUSEKEEPING AND CLOSE SESSION FOR DAY ONE
19:00-21:00	***Welcome Reception Dinner***
DAY TWO: 03 November 2015	
Session Two: Land Use Change and its Impacts on Biodiversity and Ecosystem Services (B&ES)	
Co-Chairs for the session: Dr. Tsogtbaatar JAMSRAN and Prof. Alexander STERIN	
09:00-9:30	**Rapid Talks**
	1. Problems of the Russian Far East Land Use and their Biodiversity Impacts *Dr. Andrey V. Adrianov, Russian Academy of Sciences, RUSSIAN FEDERATION*
	2. Has the Land Conversion Policy Conserved B&ES? Evidence from Wetland Ecosystem in China *Dr. Lin Zhen, Deputy Director of Global Land Project Beijing Nodal Office, CHINA*
	3. Land Use/Cover Change in Semi-arid Region of China and its Impacts on Regional Climate *Prof. Weidong Guo, iLEAPS, Nanjing University, CHINA*
09:30-10:15	**Panel Session**
	Facilitator: Prof. Jianlong Li Panellist 1: Dr. Andrey V. Adrianov Panellist 2: Dr. Lin Zhen Panellist 3: Prof. Weidong Guo
10:15-10:30	***Refreshments***
10:30-11:30	**Knowledge-Sharing Café Kiosk Session Two**
	Café Kiosk 1 – | Café Kiosk 2 – | Café Kiosk 3 -

	Science & Policy Led by Dr. Chuluun Togtokh	Knowledge Management Led by Dr. Konstantin Lutaenko	Communication Led by Dr. Ailikun
11:30-12:30	**Roundtable Discussion on Kiosk Outputs** Led by Co-Chairs for the session with summaries from each Kiosk session (A representative from each Kiosk team will have 10 minutes to provide a brief summary of the outcomes)		
12:30-13:30	***Lunch***		
13:30-15:00	**Participatory Games**		
Session Three: Sustainable Land Use Practice for Mitigation and Adaptation			
Co-Chairs for the Session: Dr. Koji Kumamaru and Dr. Soojeong MYEONG			
15:00-15:15 **15:15-15:45**	***Refreshments*** **Rapid Talks**		
	1. Social-ecological Systems and Land Use Change – Linkages with SDGs, Adaptation and Mitigation Plans *Dr. Dennis S. Ojima, Colorado State University, USA* ***TALKED ABOUT FUTURE EARTH AND ITS COLLABORATION AT THE GLOBAL LEVEL***		
	2. Climate Change, Grassland Degradation and Adaptive Management Strategies of Livestock Production *Prof. Xiangzheng Deng, Center for Chinese Agricultural Policy, CHINA*		
	3. Innovative Adaptation of Pastoral Systems in Mongolia *Dr. Chuluun Togtokh, Dryland Sustainability Institute (DSI),MONGOLIA*		
15:45-16:15	**Panel Session**		
	Facilitator: Dr. Enkhtuya Oidov Panellist 1: Dr. Dennis S. OJIMA, Panellist 2: Prof. Xiangzheng Deng Panellist 3: Dr. Chuluun Togtokh		
16:15-17:00	**Knowledge-Sharing Café Kiosk Session Three**		
	Café Kiosk 1 – Science & Policy	Café Kiosk 2 – Knowledge Management	Café Kiosk 3 - Communication

	Led by Dr. Chuluun Togtokh	Led by Dr. Konstantin Lutaenko	Led by Dr. Ailikun
17:00-17:45	**Roundtable Discussion on Kiosk Outputs** Led by Co-Chairs for the session with summaries from the Kiosk session (Kiosk Leaders or representative from Kiosk team can present the discussion summary)		
17:45-18:00	**Daily Media Round-up on Day's Accomplishments** Led by Co-Chairs for the session with perspectives from Media participants		
HOUSEKEEPING AND CLOSE SESSION FOR DAY TWO **Dinner in your free time**			
DAY THREE: 04 November 2015			
Session Four: Briefing Outcome of the Dialogue			
Co-Chairs for the session: Mr. Bayarbat DASHZEVEG and Dr. Linda STEVENSON			
09:00-09:40	**Sharing thoughts**		
	"Where we have been and where we should go …." By Kiosk Leaders		
09:40-10:00	**Sharing Thoughts (*3-Minutes For Each National Focal Points of TEA)*** "What we have learned to facilitate better science-policy interactions…" China SPG - Dr. Wenjie Dong Japan nFP - Dr. Akio Takemoto/ Dr. Koji Kumamaru Mongolia nFP - Mr. Bayarbat Dashzeveg Republic of Korea SPG – Dr. Soojeong Myeong Russian Federation nFP - Dr. Andrey V. Adrianov		
09:40-10:00	**Sharing thoughts "Voices of Youth"** Each young scientists' team will have 5 minutes to share their groups' view on how science should contribute to policy planning in future		
10:00-10:30	***Refreshments***		
10:30-12:00	**Roundtable Dialogue** Each participant will have the floor for 1 minute and provide their remarks on way forward for two-way approaches in science-policy engagement		
12:00-12:20	**Media Round-up/Conclusion** Led by Co-Chairs for the session with perspectives from Media participants		

12:20-12:30	**Closing Remarks** Mr. Hiroshi Tsujihara, APN Secretariat Director Mr. Bajarbat Dashzeveg, nFP of MONGOLIA
HOUSEKEEPING AND END OF THE DIALOGUE	

FIELD TRIP TO HUSTAI NATIONAL PARK on 5th NOVEMBER.

The Mongolian Government declared Hustai National Park as a Specially Protected Area in 1993, one year after the initiation of the reintroduction project of the Takhi to the Hustain Nuruu. The HNP extends through the Khentii Mountains and includes the western edge of the Mongolian steppe at the boundaries of Altanbulag, Argalant and Bayankhangai Soums of Tov province. The park is about 95 km from the capital city of Ulaanbaatar to the west.

Group photograph of the 3rd APN Science-Policy Dialogue

Appendix 02-List of Participants

Chief Guest
Mr M.Khurelsukh
Vice Minister
Ministry of Environment, Green Development and Tourism
Government Building 2, United Nation's street 5/2, Ulaanbaatar-210646
MONGOLIA

TEA-SRC members

China SPG
Prof. Wenjie Dong
Deputy Director, State Key Laboratory of Earth Surface
Processes and Resource Ecology, College of Global Change and Earth System Science
Beijing Normal University, 19 Xinjiekou Wai Street, Beijing 100875
CHINA
Tel: +86-10-13601357410; Fax: +86-10-58802219
Email: dongwj@bnu.edu.cn

Japan nFP
Dr. Akio Takemoto
Director, Research and Information Office
Global Environment Bureau, Ministry of the Environment
17th floor Daido Seimei Kasumigaseki Bldg., 1-4-2 Kasumigaseki
Chiyoda-Ku, Tokyo 100-0013
JAPAN
Tel: +81-3-5521-8247; Fax: +81-3-3581-4815
Email: akio_takemoto@env.go.jp

Japan SPG
Dr. Kensuke Fukushi
Professor Integrated Research System for Sustainability Science
Department of Urban Engineering, The University of Tokyo
7-3-1 Hongo, Bunkyo-Ku, Tokyo, 113-8654
JAPAN
Tel: +81-3-5841-1542; Fax: +81-3-5841-1543
Email: fukushi@ir3s.u-tokyo.ac.jp

Mongolia nFP
Mr. Bayarbat Dashzeveg
Head, Unit for Soil Protection & Combat to Desertification
National Committee to Soil Protection and Combat Desertification
Ministry of Environment, Green Development and Tourism
Government Building 2 United Nation's street 5/2, Ulaanbaatar-210646
MONGOLIA
Tel: +976-11-311127; Fax: +976-11-450161
Email: bayarbt318@gmail.com

Mongolia SPG
Dr. Tsogtbaatar Jamsran
Director Institute of GeoEcology
Mongolian Academy of Sciences, Baruun Selbe-15
Chingeltei District, Ulaanbaatar 211238
MONGOLIA
Tel: +976-11-325487; Fax: +976-11-321862
Email: tsogtbaatar2014@gmail.com

Republic of Korea SPG
Dr. Soojeong Myeong
Senior Research Fellow
1027 Building B. Sejong Research Complex
370 Sicheong-daero
Sejong-si (339-007)
REPUBLIC OF KOREA
Email: sjmyeong@kei.re.kr; sjmyeong@gmail.com

Russian Federation nFP
Dr. Andrey V. Adrianov
Director A.V. Zhirmunsky Institute of Marine Biology
Far East Branch, Russian Academy of Sciences
Palchevsky Street, 17 Vladivostok 690041
RUSSIAN FEDERATION
Email: avadr@mail.ru

Russian Federation SPG
Prof. Alexander Sterin
Deputy Director
Russian Research Institute for Hydro meteorological Information
World Data Center (RIHMI-WDC)
6 Korolyov Street, Obninsk, Kaluga Region 249035
RUSSIAN FEDERATION
Tel: +7-48439-74658; Fax: +7-48439-68611
Email: sterin@meteo.ru

Country Representatives

China
Ms. Fang Zhang
Division Director, Science and Technology Department of Henan Province
Room 2206, No 27, Huayuan Road, Zhengzhou City
Henan Province, 450008
CHINA
Tel: +86 13700885656
Email: zf9116@163.com

China
Mr. Peng Shaoming
Chief Engineer, Yellow River Engineering Consulting Co. Ltd
109 JInshui Road Zhengzhou, 450003
CHINA
Tel: +86 13203893259
Email: pengshming@163.com

Japan
Mr. Yosuke Horie
Hyogo Prefectural Institute of Environmental Sciences
3-1-18 Yukihira, Suma-ku, Kobe
JAPAN
Tel: +81-78-735-6911
Email: horie-y@hies-hyogo.jp

Japan
Dr. Koji Kumamaru
Ministry of Environment, Government of Japan
Climate Change Adaptation Specialist
1-2-2, Kasumigaseki, Chiyoda-Ku, Tokyo, 100-8975
JAPAN
Tel : +81(0)355218247
Email: KOJI_KUMAMARU@env.go.jp

Mongolia
Mr Kh. Tuvshinbayar
Head of the Science Technology Division
Ministry of Environment and Green Development and Tourism
Government Building 2 United Nation's street 5/2, Ulaanbaatar-210646
MONGOLIA
Email: tuvshin_eko@yahoo.com

Mongolia
Ms G. Khorolmaa
Senior Officer of Science Technology Division
Ministry of Environment, Green Development and Tourism
Government Building 2 United Nation's street 5/2, Ulaanbaatar-210646
MONGOLIA
Email: horolmaa11@gmail.com

Mongolia
Ms D. Elbegsaikhan
Officer of the Department of Land Management and Integrated Water Management
Ministry of Environment, Green Development and Tourism
Government Building 2 United Nation's street 5/2, Ulaanbaatar-210646
MONGOLIA
Email: elbegee_e@yahoo.com

Mongolia
Ms. Ch. Munkhzul
Officer, Department of Green Development Policy and Strategic Planning
Ministry of Environment, Green Development and Tourism
UN Street 5/2, Government building#2, Ulaanbaatar-15160
MONGOLIA
Tel/Fax: + 976 11 311278
E-mail: ch_munkhzul@mne.gov.mn; happy_zul@yahoo.com

Republic of Korea
Ms. Jeonga Woo
Ministry of Environment
Building #6, Government Complex-Sejong
11 Doum 6-ro, Sejong Special Self-Governing City, 339-012
REPUBLIC OF KOREA
Email: jamie17@korea.kr

International Invitees

Chinese Academy of Sciences (CAS)
Prof. Ailikun
Institute of Atmospheric Physics
Chinese Academy of Sciences, P.O. Box 9804, Beijing 100029
CHINA
Tel: +86-10-82995264; Fax: +86-10-82995161
Email: aili@mairs-essp.org

Chinese Academy of Sciences (CAS)
Dr. Lin Zhen
Deputy Director of Global Land Project Beijing Nodal Office
Institute of Geographic Sciences and Natural Resources Research (IGSNRR)
Chinese Academy of Sciences, 11A Datun Road, Chaoyang District, Beijing
CHINA
Tel: +86-10-64888155 Fax: +86-10-64851844
Email: zhenl@igsnrr.ac.cn

Chinese Academy of Sciences (CAS)
Prof. Dr. Xiangzheng Deng
Director of the External Cooperation Division
Institute of Geographic Sciences and Natural Resources Research
Chinese Academy of Sciences (CAS), Center for Chinese Agricultural Policy
CAS No 11A, Datun Road, Anwai, Beijing, 100110
CHINA
Tel: + 86 10 6488 8980
Email: dengxz.ccap@igsnrr.ac.cn

Colorado State University
Dr. Dennis S. Ojima
Natural Resource Ecology Laboratory
Campus Mail 1499, Colorado State University
Fort Collins , CO 80523-1499
UNITED STATES OF AMERICA
Tel: 970- 491-1976; Fax: 970-491-1965
Email: Dennis.Ojima@colostate.edu

Hokkaido University
Prof. Teiji Watanabe
Group of Environmental Geography, Section of Integrated Environmental Science
Faculty of Environmental Earth Science, Hokkaido University
W-5, N-10, Sapporo, 060-0810,
JAPAN
Tel & Fax: +81-11-706-2213
E-mail: teiwata@mac.com; twata@ees.hokudai.ac.jp

iLEAPS
Prof. Weidong Guo
Assistant Director
Institute for Climate and Global Change Research School of Atmospheric
Sciences, Nanjing University Nanjing, 210093
CHINA
Tel: 025 8359 2873
Email: guowd@nju.edu.cn

Kangwon National University,
Prof. Sinkyu Kang
Department of Environmental Science
Kangwon National University
Chunchon, Kangwon 200-701
REPUBLIC OF KOREA
Tel: + 82 (33) 250-8578
Email: kangsk@kangwon.ac.kr

Nanjing University
Prof. Jianlong Li
The Global Change Research Institute
College of Life Science, Nanjing University
22 HanKou Road, Nanjing City, 210093
CHINA
Tel: 0086-25-83592715(O), 86214644(H)
Email: jlli2008@nju.edu.cn; jianlongli@sina.com

Russian Academy of Sciences
Dr. Konstantin A. Lutaenko
Head of the International Cooperation Department
A.V. Zhirmunsky Institute of Marine Biology
Far East Branch of the Russian Academy of Sciences
Palchevsky Street, 17, Vladivostok 690041
RUSSIAN FEDERATION
Tel: +7 423 2317111 Fax: +7 423 2310900
Email: lutaenko@mail.ru

University of Copenhagen
Prof. Alexander Prishchepov
University of Copenhagen, Section of Geography
Øster Voldgade 10 1350 København K
DENMARK
Tel: +45 35 33 13 86
Email: alpr@ign.ku.dk

Observer
Dr. Geetha Mohan
Project Researcher, Todai Institutes for Advanced Study (TODIAS)
Integrated Research System for Sustainability Science (IR3S)
The University of Tokyo, 7-3-1 Hongo
Tokyo, 113-8654
JAPAN
TEL: +81-3-5841-1541 FAX: +81-3-5841-1549
Email: geetha@ir3s.u-tokyo.ac.jp

Local Invitees

Dryland Sustainability Institute (DSI)
Dr. Chuluun Togtokh
Dryland Sustainability Institute (DSI)
Central Post Office, P.O. Box: 44/243, Partizan Street 31
Sukhbaatar district 5, Ulaanbaatar 14250
MONGOLIA
Tel: 976-11-463089
Email: CHULUUN.TOGTOKH@colostate.edu

GGGI
Ms. Bulganmurun Tsevegjav
Senior Program Officer, Green Growth Planning and Implementation
Global Green Growth Institute in Mongolia
United Nations street 5/2 Chingeltei district, Government House-II
Ulaanbaatar 15160
MONGOLIA
Tel: +976 9912 2030
E-mail: bulganmurun.ts@gggi.org

GEF/UNDP
Mr. S. Tumurchudur
National Technical Director
GEF/UNDP
"Integrated Natural Resources Management in the Baikal Basin Transboundary Ecosystem" project
Ulaanbaatar
MONGOLIA
Tel/Fax: +976-11363423
Email: TumurchudurS@unops.org

Green Gold project, SDC Mongolia
Ms. Bulgamaa Densambuu
Applied Research Component leader
Sky plaza Business Centre, Olympic street 12, Khoroo 1
Sukhbaatar District, Ulaanbaatar
MONGOLIA
Tel: +976 11 326491-3 Fax: +976 11 326517
Email: bulgamaa@greengold.mn

Mongolian University of Life Sciences
Dr. Goomaral Altansukh
Center for Ecosystem Studies, Mongolian University of Life Sciences
P.O.Box-61, Ulaanbaatar 17024
MONGOLIA
Tel: +976-11-341549 Fax: +976-11-341549
Email: goomaral@muls.edu.mn

Mongolian University of Life Sciences
Ms. Oyunsuvd Sumiya
Center for Ecosystem Studies, Mongolian University of Life Sciences
P.O.Box-61, Ulaanbaatar 17024
MONGOLIA
Tel: +976-11-341549 Fax: +976-11-341549
Email: oyunsuvd@muls.edu.mn

Mongolian University of Life Sciences
Dr. Undarmaa Jamsran
Head, Center for Ecosystem Studies
Mongolian University of Life Sciences
P.O.Box-61, Ulaanbaatar 17024
MONGOLIA
Tel: +976-11-341549
Email: j_undarmaa@muls.edu.mn

The Nature Conservancy
Mr. Enkhtuya Oidov
Country Program Director Mongolia
Sukhbaatar district, 1khoroo, Peace Avenue 10/5
DHL building 2nd floor, 14201 Ulaanbaatar
MONGOLIA
Tel: 976 -70118526 Fax: 976-70118525
Email: eoidov@tnc.org

UNDP
Mr. Bunchingiv Bazartseren
United Nations Development Programme (UNDP) in Mongolia
UN House, UN Street-14, Sukhbaatar District
Ulaanbaatar-14201
MONGOLIA
Tel: 976 11 327585, Fax: 976 11 326221
Email: bunchingiv.bazartseren@undp.org

Journalist
Ms. Zolzaya Enkhtur
People Centered Conservation NGO
Room 608, Gutal office, Chingis Avenue,Khan-Uul District
Ulaanbaatar
MONGOLIA
Email: newcinemon@gmail.com

Journalist
Ms. Ariuntuya Ayurzana
Communications and Partnership Specialist
The Press Institute of Mongolia
210620/347 Ih Toiruu 11b, Ulaanbaatar
MONGOLIA
Tel: (976 11) 350003, 9411-6996 Fax: (976-11) 350002
E-mail: ariukaa@pressinst.org.mn

Young Scientists

China
Mr. Chao Wang
The Institute of Geographic Sciences and Natural Resources Research
CAS 11A, Datun Road, Chaoyang District, Beijing
CHINA
Tel: +89 18810803398 Fax: 010 - 64854230
Email: wangc.12b@igsnrr.ac.cn

Japan
Mr. Hideyuki Mohri
United Nations University
Institute for the Advanced Study of Sustainability
5-53-70 Jingumae, Shibuya, Tokyo
JAPAN
Email: mohri@unu.edu

Japan
Ms. Jie Liu
Graduate school of Environmental Science
Hokkaido University Hokkaido University N10W5, Sapporo, Hokkaido
JAPAN
Email: helena813j@163.com

Mongolia
Mrs. Zolzaya Lkhamsuren
Secretary of MGA Room number - 208
Taiwan Cultural Center, Tourist street- 38
Chingeltei District, Ulaanbaatar
MONGOLIA
Tel: +976-99026877, Fax: +976-70006696
E-mail: zolzayamust@gmail.com

Mongolia
Mr. Gankhuyag Purev-Ochir
Mongolian Bird Conservation Center Unity Center
room#502, 12 khoroolol, VIII khoroo, Oyutnii gudamj-44
Sukhbaatar District, Ulaanbaatar
MONGOLIA
E-mail: pgankhuyag@gmail.com

Mongolia
Dr. Suvdantsetseg Balt
National development institute of Mongolia
Suhbaatar district, 5th khoroo, Partizan Street-31, Ulaanbaatar 14250
MONGOLIA
Tel: 99761800 Fax: 266173
Email: suvd16@yahoo.com

Mongolia
Dr. Altansukh Ochir
School of Engineering and Applied Sciences
National University of Mongolia, Building 3, room 313
Ikh Surguuli Street-1, Ulaanbaatar, 210646
MONGOLIA
Tel: 976-91993096
Email: altansukh22@yahoo.com

Mongolia
Dr. Anarmaa Sharkhuu
New Mongol Institute of Technology
13th khoroolol, 25th khoroo, Bayanzurkh duureg
Ulaanbaatar
MONGOLIA
Tel: +976-9595-1267 Fax: +976-7577-7799
Email: anarmaa.sh@gmail.com

Republic of Korea
Ms. Jooyeon Moon
Korea University Anam-dong 5 ga
Seongbuk-gu, Seoul, 136-713, #322 East Building
College of Life Science, Korea University
REPUBLIC OF KOREA
Tel +821062532167
Email: mjy891024@gmail.com

Republic of Korea
Mr. Cholho Song
Korea University 136-173, Korea University
College of Life Science, East Building, Room No.322
Environ. GIS/RS Lab., Anamdong, Seoungbukgu, Seoul
REPUBLIC OF KOREA
Tel +82 10 9282 0198
Email: cholhosong@gmail.com

Russian Federation
Mr. Anton Uspenski
Main Geophysical Observatory, Saint-Petersburg
194021, Russia Saint-Petersburg ul. Karbysheva
RUSSIAN FEDERATION
Tel: (964) 330-69-67
Email : uspiensan@gmail.com

Russian Federation
Mr. Iurii Petrunenko
Pacific Geographical Institute
FEB RAS Radio street 7, Vladivostok, 690041
RUSSIAN FEDERATION
Tel: +79244340682
Email: yurbarius@gmail.com

Russian Federation
Ms. Svetlana Tsymliakova
Tver State Technical University
Afanasii Nikitin st. 22, Tver
RUSSIAN FEDERATION
Tel: 89206983949
E-mail: thymliakova.svetlana@gmail.com

APN

Mr. Hiroshi Tsujihara
Director, APN Secretariat
East Building, 4F, 1-5-2 Wakinohama Kaigan Dori
Chuo-ku, Kobe 651-0073
JAPAN
Tel: +81-78-230-8017
Email: htsujihara@apn-gcr.org

Dr. Linda Anne Stevenson
Head, Communication & Scientific Affairs Division, APN Secretariat
East Building, 4F, 1-5-2 Wakinohama Kaigan Dori
Chuo-ku, Kobe 651-0073,
JAPAN
Tel: +81-78-230-8017
Email: lastevenson@apn-gcr.org

Ms. Taniya Jayani Koswatta
Coordinator, APN Secretariat
East Building, 4F, 1-5-2 Wakinohama Kaigan Dori
Chuo-ku, Kobe 651-0073
JAPAN
Tel: +81-78-230-8017
Email: tkoswatta@apn-gcr.org

Local Organizing committee

Dryland Sustainability Institute (DSI)
Dr. Myagmarsuren Altanbagana
National Development Institute of Mongolian
Sukhbaatar district, 5-r khoroo, Partizan street-31
Ulaanbaatar 14250
MONGOLIA
Tel: 976-51-266168, 976-99107441
Email: a_baganad@yahoo.com

Dryland Sustainability Institute (DSI)
Ms. Zoljargal Jargalsaikhan
Dryland Sustainability Institute (DSI)
Central Post Office, P.O. Box: 44/243
Partizan Street 31, Sukhbaatar district 5, Ulaanbaatar 14250
MONGOLIA
Email: jargalzoloo@yahoo.com

Dryland Sustainability Institute (DSI)
Ms. Tserenchunt Battumur
Dryland Sustainability Institute (DSI)
Central Post Office, P.O. Box: 44/243
Partizan street 31, Sukhbaatar district 5, Ulaanbaatar 14250
MONGOLIA
Tel: 976-99063748
Email: chunt@kangwon.ac.kr

Volunteer
Ms. Diimaa Sangi
Center for Ecosystem Studies, Mongolian University of Life Sciences
P.O.Box-61, Ulaanbaatar-53
MONGOLIA
Tel: +976 341549 Fax: +976 11 341549
Email: diimaa_s@yahoo.com

Volunteer
Ms. Narangerel Tseden-Ish
Center for Ecosystem Studies, Mongolian University of Life Sciences
P.O.Box-61, Ulaanbaatar-53
MONGOLIA
Tel: +976 341549 Fax: +976 11 341549
Email ts_narangerel@muls.edu.mn

Volunteer
Ms. Sumiya Bilegsaikhan
Sukhbaatar district, Ulaanbaatar
MONGOLIA
Tel: +976-88067781
E-mail: sumi@snu.ac.kr