Environmental Diplomatic Leader Education Program
University of Tsukuba, Japan

Master's Program in Environmental Sciences
Doctoral Program in Sustainable Environmental Studies

A Final Report of

International Internship in Mongolia

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University of Tsukuba

Environmental Diplomatic Leader

Strategic Funds for the Promotion of Science and Technology

Edited and completed by 2011 Mongolia internship student group

Foreword

The solution of global environmental problems unquestionably involve not only natural science related issues but also socio-economic problems such as population problems, regional or ethnic conflicts, poverty, sanitation, and the deterioration of the ecological system. In order to solve these intricately related problems, one needs a deep understanding and recognition of culture and its environmental, economic, political and social backgrounds. This is the necessity of the EDL education program and the background of its foundation.

2011 Mongolian Internship program, supported by the EDL program, is the second time since it's been held firstly last year. We are facing the global environment issues such as global warming, desertification, acid rain, water and air pollution, flood, drought, deforestation. In order to deal with these issues and realize sustainable development, we need to be able to recognize and understand culture, as well as its environmental, economic, political, and social backgrounds.

Mongolia is a country suitable for the purpose of the EDL program, because it is a typical area with semi-arid climate and also a showcase of environmental problems for the participatory students. Besides, most of the participatory students are from wet and warm regions and they seldom have chance to visit dry and cold regions such as Mongolia. We are interested in environmental problems, and have the opportunity to visit areas of concern and get fast-hand experience on the field. That is the best way to learn what an environmental problem is.

To complete this report, the participatory students were divided into three groups: environmental group, economic group and society group. The purpose of this classification will be described in detail at chapter 1.2. For collecting useful information, we visited many places, such as coal mining area, gers district, water supply facilities. The *Environmental Problem* part of this final report was completed based on the report written by ZHAO Yinxin, NAGAHAMA Kazuyo, CHEN Jie, SIMONAPENDI Maria, and TOMIMATSU Koshuke. YAMADA Watara, SHIMIZU Tashuki, HUANG Wenyu and PUN Ishwar contributed the part of *Economic Facts*. And the final part, *Social System*, got the materials from the reports by ZHANG Jie and TAKAHASHI Mizuho. The whole report was then compiled by ZHANG Jie and NAGAHAMA Kazuyo.

This report was completed by the participant students in this internship, but without the help of our professors, local collaborators, it's cannot come true. There are a lot of persons who accompanied with us. We express our heartful appreciation and recognition to them.

2011 Mongolia internship student group

2011-09-25

Catalogue

1 Introductions

1.1 A brief introduction of Mongolia

Mongolia is seen as a large landlocked country between two larger countries-Russia and China. Located on mountains and plateaus, it's one of the world's highest countries, with an average elevation of 1,580 meters. Mongolia suffers temperature extremes, with southern Mongolia dominated by the Gobi desert, and a large area of forest existing in the north (Fig.1-1). Precipitation is also very low in Mongolia. Average annual precipitation varies from about 400mm in the northern regions to less than 100-50 mm in the southern Gobi region. Precipitation also changes with altitude, with annual totals higher than 400mm confined to the mountainous areas where the growing season is also the shortest. Two-thirds to three-quarters of the annual precipitation occurs between June to August.

Figure1-1 Geographic location of Mongolia
(Source: National Geographic Online)

As for the population, compared with other countries, the population of Mongolia is very small, but its growth rate maintains a high level. Today, the Mongolia has more than 2.7 million people (Fig.1-2) with over 1 million people living in rural areas and is mainly engaged in traditional livestock herding and some crop production. The population density is one person per 1.6 square km. 68% of the total populations are young people under the age of 35. The average life

expectancy is just over 65 years. The present urban population is above 1 million. Ulaanbaatar has 800,000 inhabitants-one third of the total population of Mongolia.

Nowadays in Mongolia about 20 ethnic groups are either of Mongol or Turkish origin. Mongolian ethnic groups are divided into 3 main groups: they are the Oirat (eastern Mongolia), Khalkha and Barga in the west. About 80% of population is of the Khalkha ethnic group. In the western part of the country, a significant slice of the population speaks a dialect of Turkish. The largest of these ethnic groups are the Kazakhs, about 5% of population, and the Uriankhai located in Tuva, Tsaatan, and Khoton.

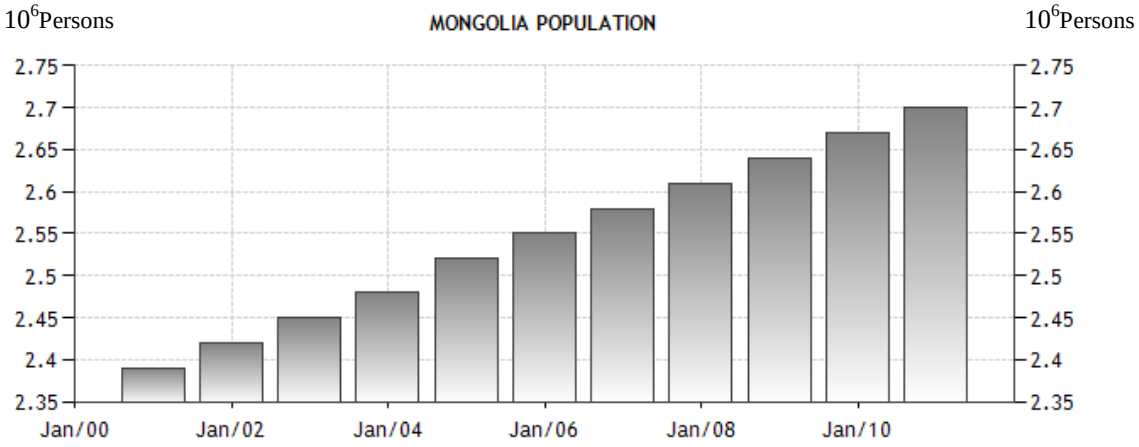

Figure1-2 Mongolia population increase tendency
(Source: the World Bank)

Economic activity in Mongolia has traditionally been based on herding and agriculture, although the development of extensive mineral deposits of copper, coal, molybdenum, tin, tungsten, and gold have emerged as a driver of industrial production. Soviet assistance, at its height one-third of GDP, disappeared almost overnight in 1990-91, leading to a very deep recession. Economic growth returned due to reform which embraced free-market economics and the extensive privatization of the formerly state-run economy.

1.2 Concept of sustainable development

The idea of sustainability dates back more than 30 years, to the new mandate adopted by the IUCN (International Union for the Conservation of Nature) in 1969. It was a key theme of the United Nations Conference on the Human Environment in Stockholm in 1972. The concept was coined explicitly to suggest that it was

possible to achieve economic growth and industrialization without environmental damage. In the ensuing decades, mainstream sustainable development thinking was progressively developed through the World Conservation Strategy (1980), the Brundtland Report (1987), and the United Nations Conference on Environment and Development in Rio (1992), as well as in national government planning and wider engagement from business leaders and non-governmental organizations of all kinds.

Over these decades, the definition of sustainable development evolved. The Brundtland Report defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. This definition was vague, but it cleverly captured two fundamental issues, the problem of the environmental degradation that so commonly accompanies economic growth and yet the need for such growth to alleviate poverty.

The core of mainstream sustainability thinking has become the idea of three dimensions, environmental, social and economic sustainability. The IUCN Program 2005-8, adopted in 2005, used the interlocking circles model (Fig.3) to demonstrate that the three objectives need to be better integrated, with action to redress the balance between dimensions of sustainability.

Due to this reason, perhaps the best way of describing a country is to use the information including environmental problems, Economic facts and social system. In order to complete this final report, we intend to represent Mongolia from these three aspects based on the information, which we investigated on the internet or from references, as well as the realities we experienced ourselves during our Mongolia internship.

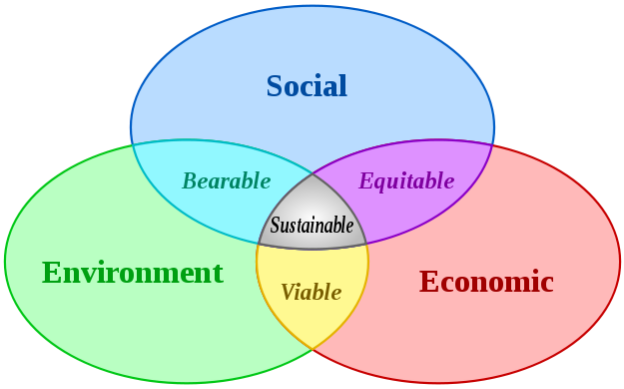

Figure1-3 Interlocking circles model of sustainable development concept (Adams, 2006)

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2 Environmental Problems

2.1 Water resources in Mongolia

2.1.1 Overview

There are more than 3,800 rivers and streams with regular run-off in Mongolia. The total length of the river network is about 6,500 km. There are 186 glaciers with a total volume of 62.5 km^3 and 3500 lakes covering total surface area of 15,600 km^2 (surface area of each exceeding 0.1 km^2) with a total volume of 500 km^3 and 8,000 river lets. Table2-1 presents the details of surface water resources in Mongolia.

Table 2-1: Types of Surface water in Mongolia

Surface water	Number	Length (km)	Area covered(sq.km)
Rivers	3811	67080	
Lakes	3500		15640
Glaciers	187		540
Springs	6899		
Mineral	250		

(Source: The United Nations Environment Program, Mongolia: State of the Environment 2002)

The potential water resources of the country are estimated to be about 36.4 km^3. Of this, the surface water resources are 22.0 km^3 and the usable groundwater resources are 12.6 km^3. About 78% of the river run-off is formed on 36 % of the

territory in northern, western, and north-eastern mountainous areas and 22 percent is formed on 64 % of the territory in the south of the country.

Water balance is as follows (The United Nations Environment Program, Mongolia: State of the Environment 2002):

- Total annual precipitation 360.0 km^3
- Total annual run-off 36.6 km^3

of which:

  - Surface run-off 24.6 km^3
  - Ground water flow 12.0 km^3

- Total soil moisture 202.0 km^3
- Total evaporation 190.0 km^3

On an average, the annual amount of water resources per capita is 17,300 m^3. However, it ranges from 4,500 m^3 per capita in the Gobi area to 46,000 m^3 per capita in northern and central areas.

The total mean annual precipitation over Mongolia is estimated to be 360 km^3 of water or 230 mm per year (nationwide average); about 90 % of this is lost through evapotranspiration, 4 % infiltrates to aquifers, and 6 % contributes to surface flow.

In 2001, there were 107 guards and 17 stations acting at 70 rivers, 1 spring and 9 lakes. Guards and stations undertake studies on water regime, quality and composition. They take measurements on water biology with 54 indices, evaporation with 8 indices and water pass-over with 81 indices. In fact, these measurements are three times lower than the world average. Photo2-1 shows a live demonstration of hydrologic observation on a river in the Sanzai gap area. Through the accumulated data by years, the changes of water regime and water quality could be determined.

Photo2-1 Hydrologic observation

In 2000 (77 % of probability) 19 km^3 of

water was formed in the territory of Mongolia. Mongolia's annual surface run-off has increased since 1988 and reached its maximum of 78.4 km^3. Figure2-1 shows the annual surface run off in Mongolia.

Figure 2-1: Mongolia's annual surface run-off (km^3/year)
(Source: The United Nations Environment Program, Mongolia: State of the Environment 2002)

2.1.2 Water consumption situation

Annual water use in Mongolia is estimated to be about 500 million m^3, the distribution of which is shown in Figure 2-2.

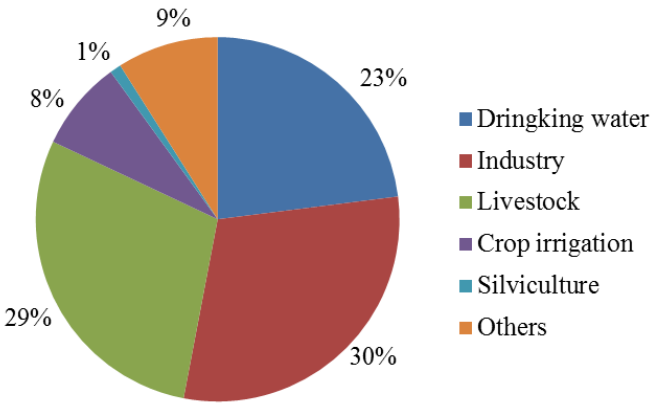

Figure 2-2: Water uses distribution
(Source: Ministry of nature and environment -2000)

Water supply from the underground sources is about 80% of total water consumption. 30.8% of the population of Mongolia is supplied with water from centralized water-supply system, while 24.8% are supplied from water transportation service, 35.7% from water supply points and 9.1% are from springs, rivers and snow water respectively. Drinking water is supplied from different sources as shown in Figure 2-3.

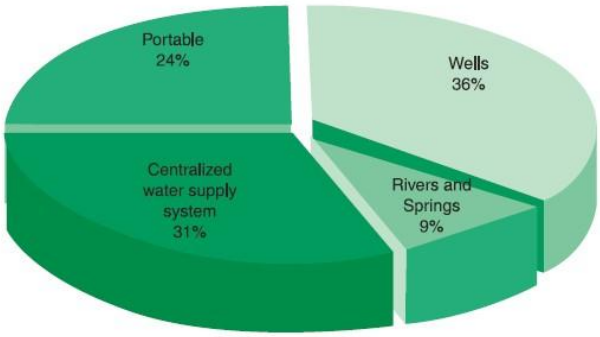

Figure 2-3 Drinking water supply sources
(Source: Ministry of nature and environment -2000)

Of the drinking water supply sources, the largest proportions are wells. In the Ger area in the north part of Ulaanbaatar city, some residents have wells drilled by themselves, as shown in Photo2-2. This kind of well can provide drinking water for domestic use from spring to autumn. Due to low temperatures, the wells do not work in winter. Therefore, production wells play a very important role, especially during winter when many household wells are frozen. Photo2-2 shows a production well in the Sanzai area. The depth of the production well is 58 m, and the total construction cost is 5,800,000 Mongolian Tugrik. Some families buy drinking water from the production well (Photo2-3), especially the rich who do not have wells themselves. The water is not expensive. It costs only 4 Mongolian Tugrik per liter.

Photo 2-2: Household well in Sanzai area

In recent years, improvements in groundwater wells have been the most widespread structural measure for the exploitation of water resources in Mongolia.

Photo2-3: Production well in Sanzai area

Photo 2-4: Spring in Dambadarjaa for drinking water

Although the rivers and springs only provide 9% drinking water, the role of springs are also very important. The people of the Ger area can use spring water for drinking and domestic use at no cost. Spring streams originating in the high mountain areas normally carry relatively clean water, but with the development of mining industry, the quality of some spring water has been polluted. For example, the nitrate concentration (60 mg L^{-1}) in this spring water has exceeded the maximum level (44.3mg·L^{-1}) promoted by USEPA, as seen in Photo 2-4.

Water consumption per capita in Mongolia is 3 to 4 times lower than the world average. According to studies, water consumption of the population living in the Ger districts, large cities, aimag centers, and big settlements is about to 8 to 10 liters per person per day; which is 4 to 5 times lower than the acceptable standard. However, water consumption in Ulaanbaatar exceeds the average of that in the developed countries. It shows that there is a significant waste of water. There are irregular repairs and maintenance services in the municipal water supply line of the capital. If drinking water continues to be wasted in this way, the capital city's drinking water supply is likely to face severe problems in the near future.

2.1.3 Water problems and solutions

At the present time water pollution is serious problem in Mongolia, especially in urban areas and in the gold placer mining locations. Recently, the exploration of natural resources, e.g. gold mining and gravel extraction has been rapidly increasing. Accordingly, the threat from mining pollution has also been increasing. As a result, over half of the population of Mongolia is at an immediate risk from air and water pollution. Mongolia is home to some of the Earth's largest untapped gold, copper, and uranium reserves. There are officially 1,083 active mine sites in Mongolia, only 419 of which are legal. There is no official data on the scope of illegal mining, but both legal and illegal mining are wreaking terrible damage on Mongolia's environment. The "gold rush" in Mongolia is leading to irreversible environmental degradation and excessive river pollution. According to the Mongolian government, 900 streams and small rivers have gone dry or have completely disappeared in the last 15 years from outdated gold extraction methods such as dredging and river diversion (Galina Angarova,2009). Due to mining activities, the water sedimentation has increased by 8 times that of the permitted

standard. Also heavy metals such as Zn, Mn, Fe, As, Au, Pb are found in the river water (Photo 2-5).

Photo 2-5 water pollution induced by coal mining

Mongolia's water resources are very susceptible to the pressures of over-utilization for human activity. The increasing water consumption has resulted due to an expansion of population, production, and enterprise activities. A considerable waste in the use of water in some regions of the country has also put pressure on the water resources. The deterioration and pollution of water sources near the large cities and settlements has negatively impacted the living environment of the human population. Water run-off in the Tuul, Haraa and Herlen rivers are decreasing and the rates of pollution in these rivers have exceeded the permissible limits by several times. This has been mainly due to the intensive timber work carried out in the water-feed zone of these rivers without proper management.

It has been reported that groundwater tables are lowering over time and some wells and springs are also drying up. These effects are also observed seasonally, for example in Ulaanbaatar, which typically experiences an insufficient supply from the municipal water system in March or April each year due to lowering of groundwater levels at supply wells. Also, water quality has also been a problem in recent years.

In order to alleviate the problems of the water resources, some solutions should be made as follows:

1) Strictly enforce the legal framework (Water Law, Water Use Fees Law, etc.) on water supply, disposal and wastewater treatment, and further update some of these laws.

2) Increase investment and rehabilitate existing water supply networks for the domestic water supply.

3) Raise public awareness about saving water, build water recycling plants, and improve the management of water supply utilities.

4) Do more to improve water quality, particularly through the rehabilitation of wastewater treatment plants. This should include the introduction of practices to reuse and recycle wastewater.

2.2 Forest ecosystem in Mongolia

2.2.1 Introduction

Mongolia is a forest-poor country (at the end of 2006 forest cover area was about 8.14 percent). Mongolia has a total land area of 157 million hectares (FAO 2006). Forest reserve lands comprise 18.3 million hectares, with 12.9 million hectares of forest-covered area; this includes 10.5 million hectares of coniferous and hardwood forests, which is equivalent to 67 percent of the forest reserve. The country spans the major transition zone between the deserts of Central Asia and the boreal taiga of Siberia, which comprises six broad bio-geoclimatic zones. The climatic zones are desert, desert steppe, steppe, forest steppe, boreal forest and mountain. The forest steppe, boreal forest and mountain zones all exhibit varying depths and distributions of permafrost.

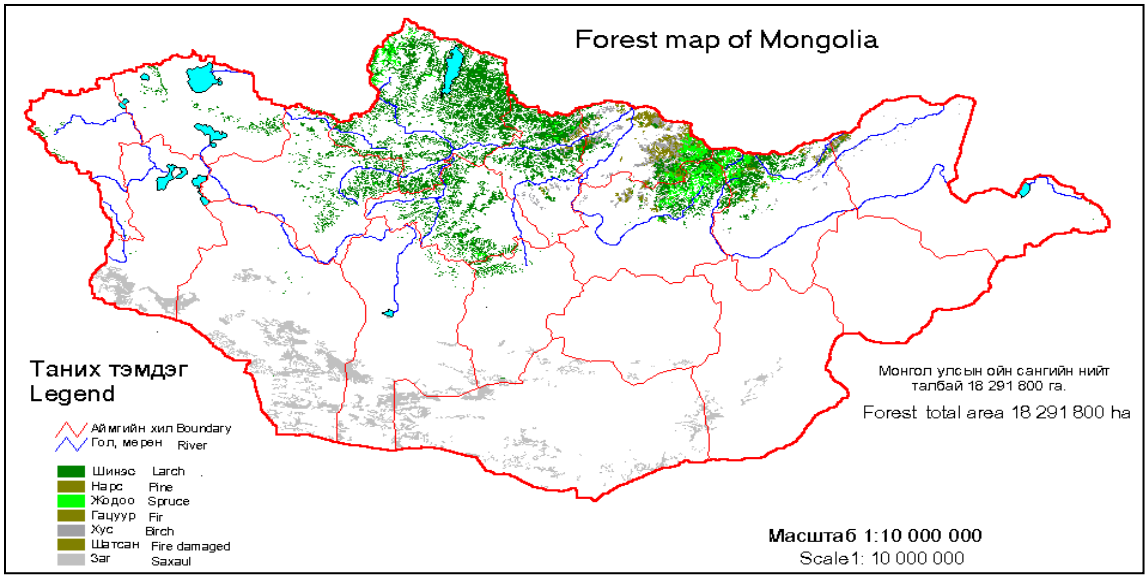

Figure 2-4 Forest cover map
(Source: WWF Mongolia Program Office)

Figure 2-4 shows forest resource locations in Mongolia. Forest resources are not evenly distributed with most forests in the north, while the south and west mainly comprise steppe and desert ecosystems.

2.2.2 Forest degradation

When we visited Mongolia this summer, one thing found is that the amount of forest covering the land is very low. In 1994, the total designated forest area of Mongolia was 17.5 million ha, including 12.7 million ha of closed forest or 8.1% of the total land area (Tsogtbaatar, 2004). Based on their basic functions, forests in Mongolia are subdivided into 3 types: special forests, protected forests, and industrial forests. Nowadays Mongolia faces the same forestry problems with others developing countries, namely deforestation. There are three main factors that bring about deforestation in Mongolia:

1. Increasing livestock numbers
2. Increasing demand for fuel and industrial wood
3. Forests fire impacts

Regarding deforestation due to the demand for fuel, I could found a direct correlation between both of them when our team visited one of the biggest coal mine area in Mongolia, the Baganuur coal mine.

When one engineer of hydrogeology from this mine company gave us an explanation about their activities, he said that approximately 50% of vegetation has decreased since this mining area was established in 1968. Despite this, he said that they never receive any complains about environmental problems from the local people, I think that this coal mining is not environmentally benign, especially for the forests. Undesirable side effects of this activity include a decline of the ground water level and destruction of plant cover in fragile areas, etc.

There is one factor whose effects can't be predicted which has caused deforestation in Mongolia. It was the use of wood by local people to build the ger frames and also furniture for the interiors. Even in Ulaanbaatar, the capital city of Mongolia, we can see the influence of the ger is still rich. A typical Mongolian house is surrounded by a fence made from wood (Photo 2-6). This factor might be one of many factors causing deforestation in Mongolia.

Photo 2-6 Wooden defense in pasture area

According to some statistics, the forest area in Mongolia has decreased by 1.2 million ha over the last 20 years. To prevent deforestation, reforestation is needed. However, Mongolia does not have a long history regarding plantations and reforestation. Since 1970, Mongolian forestry and timber-harvesting companies have been instructed by the state to follow a 5-year plan to harvest wild seeds, breed seedlings and conduct reforestation activities. Also, 1997-2000 the government of Mongolia has also supported significant efforts at reforestation.

Many people in Mongolia believe that water is their most important resource, and perhaps that's why many Mongolian researchers have a tendency to focus on water. However, one thing to remember, forests also play any important roles in our lives, as soil erosion preventer, for biodiversity preservation, and also regulating the water regime, etc.

Climatic influences, especially reduced precipitation over the past 20 years, have increased the susceptibility of forest fires. The fire risk is high approximately 75 percent of the time, and 80 percent of fires are caused by careless human activities which degrade the forest quality, through degraded species composition, damage by insect infestations, and the deterioration of forest soils. To protect forests against fire, early-warning systems need to be developed to enable rapid responses to extinguish fires before they become serious.

Approximately 40 percent of Mongolia's forests are already suffering from degradation as a result of detrimental human activities, insect damage and fire. For example, around 50 000 hectares of saxaul forests – known in Mongolia as "zag" (*Haloxylon ammodendron*) a desert plant – have been heavily degraded or destroyed due to over-harvesting. In dry land *Aimak*, S*um*, and *Bagh* (administrative unit, sub-district) woody plants, shrubs and switch plants on common lands are often overexploited for firewood (J.G. Goldammer, 2001).

2.2.3 Forest resources management

All forests and land in Mongolia are state-owned. The Ministry of Nature and Environment (MNE) has the overall responsibility for the management of forests. The *Aimak* and *Sum* governors are responsible for forest management at local levels.

The main objective of forest resource management is to protect and develop the existing forests of Mongolia so that they make maximum contributions to soil and watershed protection, and conservation of existing ecosystems. At the same time, the forests are expected to produce, on a sustainable basis, increased volumes of industrial wood, fuel wood and minor forest products for the needs of people, and earn foreign currency through the export of wood products. The proper management and utilization of forests would create employment and income for people in less-developed parts of the country (FAO. 2010).

The community-based natural resource management procedure will be an especial focus for forestry development in Mongolia. In 2004, 25 communities were leasing about 270,000 ha of forest area. Since that time, significant expansion has occurred. A "New Community-based natural resource management procedure" was approved by the Ministry of Nature and Environment in May, 2006. It allows allocation of so called "forest funds" (i.e. areas covered by forests

including all species of trees and scrub replanted forests, and saxauls) and other natural resources to communities. The new law is expected to result in (Hijaba Ykhanbai, 2010):

• Better forest protection against illegal activities. Involving local communities in forest management and giving them a stake in the forests is expected to ensure better protection against illegal logging and timber collection, illegal hunting, and illegal setting of fires

• Entities and communities that undertake ownership of forest areas working to restore and protect the forests and ensure sound and sustainable use

• Better understanding and new initiatives by local people to protect forest resources and improve the sustainability of usage

2.2.4 Conclusions

Based on our field observations, it seems that the Mongolian economic situation is getting better because the GDP is increasing rapidly (+12% last year). However, the forest cover was not enough to contribute significantly to the Mongolian economy. Furthermore, forest fires and insects were serious problems causing damage to the forest. Also, climate change and desertification are contributing to deforestation and forest degradation.

Nevertheless, the community-based natural resource management procedure will become a special focus for forestry development in Mongolia. There is possibility that this will be a positive move towards the sustainable management of forest and natural resources.

2.3 Desertification

Desertification of arid and semi-arid lands has become an increasingly important global ecological problem over the past 20 years. In Mongolia the main type of desertification is degradation of vegetation cover caused by irrational utilization of pastures (overgrazing, cutting of trees and shrubs for fuel, development of soil biogenic crusts), and an increase of deforested and denuded land. Over 90 percent of the land area in Mongolia is classified as a fragile dry-land and 72.3 percent of it is affected by desertification, according to the Desertification Research Center of Geo-ecology Institute.

Photo 2-7 Bird eye view of Gobi from airplane

This desertification process results in an alarming expansion of the Gobi desert. The Gobi desert, one of the world's great deserts, covers much of the southern part of Mongolia. Unlike the Sahara there are few sand dunes in the Gobi; rather you'll find large barren expenses of gravel plains and rocky outcrops. The climate here is extreme. Temperatures reach +40° C in summer, while decrease to -40 in winter. The precipitation average is less than 100 mm per year, while some areas only get rain once every two or three years. Strong winds of up to 140 km/h make travel dangerous in spring and fall (The Gobi desert, online source).

Figure 2-5 The range of Gobi
(Online source)

The expansion of the Gobi (Fig.2-5) is attributed mostly to human activities, notably deforestation, overgrazing, and depletion of water resources. As a result of

overgrazing degradation of vegetative cover takes place in these areas. Increasing land pressure potentially threatens the fragile environment of Mongolia, hardly capable of higher productivity, and thus contributes to desertification. The pressure on land is threatening and in some areas already exceeding the conditions for sustainable development (The Gobi desert, online source).

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3 Economic facts

3.1 Industries in Mongolia

3.1.1 Overview

The Mongolian economy is mainly supported by the mining industry, while secondary industries, including manufacturing, contribute less (Fig.3-1). The Mongolian government relies on revenues from the mining industry to a great degree. In 2007, the Mining industry accounted for 39% of the total national revenue. Hence, the Mongolian economy tends to be affected by fluctuations in the minerals. This is one of the weak points of the Mongolian economy.

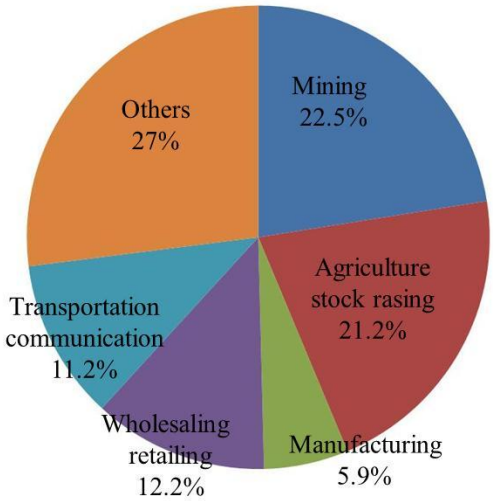

Figure 3-1 The proportion of each industry to GDP
(Source: Mongolian Statistical Yearbook 2009)

3.1.2 Mining and quarrying industry

On August 28th, 2011 we visited the Baganuur coal mine, east of Ulaanbaatar (Photo3-1). The exploration of the Baganuur coal mine began in 1925 with the help of the former Soviet Union. Coal mining is one of the Mongolia's natural resources that produce significant national income.

The deepest coal layer is 106 m below the ground surface. All coal products are consumed in Mongolia domestically. It's generally used for power plants and heating system in winter. The annual total amount of coal produced is 3 million tons. It is believed that 500 million tons are still below the ground now, so Mongolian coal mining could last for maybe another 200 years. However, the true amount is uncertain. Therefore, they have to think about a new industry which can eventually take the place of coal fuels.

On an environmental level, a problem between mining and groundwater exists. Mining began around 1978, and has lasted for about 33 years now. Unfortunately, mining areas produce not only coal but also groundwater, because coal often exists below the groundwater layer. When this occurs, workers have to pump the groundwater to another place before reaching the coal mine. The annual amount of groundwater drainage is 44 tons. Because of this, the water level of this area fell 70m from a 30 m depth in 1978 to a 100 m depth at present. This situation is unquestionably bad for the environment situation there. The risk of ground subsidence might occur in the near future.

Photo 3-1 Baganuur coal mine area

Due to the coal mining activities, we saw numerous problems: destruction of land, soil erosion, and the risk of dust pollution. The environmental impact of this coal mine could be soil erosion, dust disperse and drainage problems.

To solve the rising environmental problems which have resulted from coal mining, the Baganuur Joint stock company (BJSC) was registered in the environmental department in 2005. It is responsible for addressing the environmental issues related to coal mining. They began work on activities such as: the environmental impact due to project implementation, post mining restoration, the ancillary arising from the coal mining like gas, dust, and noise pollution which has impacted the quality of soil, air pollution and the habitats of animals.

The increasing population of Ulaanbaatar shows that there will be high demand for energy. To fulfill these demands, more coal mining factories will be set up in near future. The possible environmental condition of Mongolia will become more severe if urbanization continues. Also, it is clear that smoke arising from power plan may cause air pollution.

3.1.3 Forest industry (Hijaba Ykhanbai, 2010)

Higher economic growth is expected during the next several decades. The annual growth rate of GDP was 9.1 percent in 2006. The forest industries' share in the GNP has declined during the past 20 years. At present, the forest industry contribution to the GNP is TUG5-6 billion (0.13 percent of the GNP), and the wood processing sector contributes TUG4-5 billion (0.12 percent of the GNP). The total forestry sector contribution to the GNP is 0.26 percent, compared with 4.1 percent in 1990.

Mongolia's forest resources are used extensively to support household demands for wood and to meet demands for wood from economic sectors, especially the construction, energy, mining and agricultural sectors. In recent times, more-and-more people and entrepreneurs have been recognizing the potential uses, advantages and efficiencies of wood, and demands have been increasing year by year

Forest research centers and forest scientists estimate "allowable cuts" to be harvested from the forest resource each year. These estimates have been based on assessments of Mongolia's climate and environment to provide water protection and ecological balance, and prevent adverse effects on forest reserves.

Research over the past 20 years shows that the major cause of forest destruction in Mongolia is forest fire. On average, each year, 270 000 hectares of forests are destroyed by fire and 70 000 hectares of forests are seriously damaged by harmful insects.

During the last few years, the allowable cut has been reduced rapidly, because of severe impacts on forest ecology, especially increasing damage by fires, insect diffusion and other factors.

Shortages of quality wood to supply domestic households' and manufacturers' demands have focused the government's attention on importing wood and wooden products. Wooden materials have been exempt from import tax since 2005.

3.1.4 Energy resources in Mongolia (Hijaba Ykhanbai, 2010)

The Mongolian energy sector should be developed within a regional energy context while at the same time taking advantage of new technologies. It should improve energy security and sources of energy that might further promote economic efficiency and environmental sustainability. Energy sources include:

Coal: Total demand, 5.4 million tons per year; 3 mines produce 4.5 million tons/year; 29 small mines with capacity up to 700 000 tons/year. Future demand is expected to be 6~7 million tons/year. Proven reserves of coal are over 20 billion tons.

Fuel wood: Total annual demand: 1-2 million m^3. Government permits: 0.6 million m^3. Producing in northern *aimaks*. Projected demand: 2-3 million m^3 per year.

Petroleum products: 100 percent imported from Russia, in which Gasoline is 52%, diesel is 34%, and other fuel (oil, jet, lube) accounts for14%. LPG imports by canisters. Other gas supply options being pursued include CNG for vehicles and LPG for household use.

Electricity: Three centralized systems; 5 isolated systems, imported from Russia. Installed capacity is 879 MW, of which 823 MW come from coal-fired power-plants.

Hydropower: Mongolia has significant hydropower potential (3.5 MW existing). Hydro projects which has been started own capacity of 19 MW. The projects under confirmation are with the capacity of 6-220 MW.

Solar power: 71 percent of land receives solar energy amounting to 5.5-6 kWh/m2 with 2 900-3000 sunny hours per annum; 18 percent of land receives 4.5-5.5 kWh/m2 with 2 600-2 900 sunshine hours per annum. A 100 000 solar ger (tent house) program has been established. A solar energy utilization study was carried out in 2000.

Wind: Wind resources are suitable to use in 70 percent of the country. Wind regimes are in the order of 150-200 W/m2 and duration of 4 000-4 500 hours per year.

3.2 Foreign trade and its influence to society

In 2009, the total export value was reported to be up to 1.9 billion dollars, and the total imports were 2.1 billion dollars. Therefore, Mongolia is suffering from a trade deficit. In this situation, Mongolia exports the huge amount of copper, zinc, and coal to China, which lead to a trade surplus to Mongolia. The exports to China account for 73.9% of their total exports in 2009. Therefore, the mining industry supports a large part of the Mongolian trade structure.

The table3-1 below shows a value added contribution rate of Mongolian economy. It's clear that this nation relies on agriculture and mining & quarrying in a large part. On the contrary, there is few manufacturing, which make them have to import large amount of heavy & light industry products, from vehicle to even a toothbrush, for example. During these days of internship, I can find much facts of this.

Table3-1 % of value added of Mongolia (2005~2007)

	Agriculture, hunting, forestry and fishing	Mining and quarrying	Manu-facturing	Electricity, gas and water supply	Counstr-uction	Wholesale, retail trade, restaurants and hotels	Transport, storage and communication	Other activities
2005	24.7	24.6	4.1	3.2	2.4	10.0	12.5	21.7
2006	21.9	33.6	3.9	2.9	1.9	9.0	10.1	20.4
2007	23.0	32.6	4.5	2.5	1.9	8.5	10.7	20.5

(Source: UN Statistic Yearbook 2008)

Just as we got our baggage and were leaving from the airport, I noticed an advertisement board (Photo3-2A). *Gree* is very famous air condition manufacturer in China, and I never thought Mongolia were also in their market. Besides this, just on the road to our hotel, I found a billboard from Korea (Photo3-2B). All of these made me start to think about the industry pattern in Mongolia.

A B

Photo 3-2 Advertisement & publicity board

In Mongolia, there are very few domestic manufacturing industries, especially heavy industries. When walking in the street, the cars in front of us are mainly from Japan and Korea, and sometimes we can see KIA, a Chinese maker, or Volkswagen, a famous German brand.

Light industry and local production are not rare, but imported goods still account for a large part of basic goods, including snacks, daily articles, and clothes and so on. More interestingly, some imported goods are sold directly without any nationalized modification, for example at least an attached instruction in the native language. The fact is that I can often see the original goods here. For example, photo3-3 shows two kinds of instant noodles. The red one is from China, and the white one is produced in Japan. However, the external packing has had no changes compared with the ones sold in China or Japan's market. In other words, the information is written in Chinese or Japanese, but not Mongolian.

Photo 3-3 Imported food goods in Mongolia store

Due to a limited manufacturing situation, it's perhaps not suitable for Mongolia to develop its own manufacturing industry. However, I think the unmodified sale of imported goods is not a good way when considering native cultural protection.

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4 Social system

4.1 Religion of Mongolia

4.1.1 Overview

The history of Buddhism in Mongolia dates back to the thirteenth century when *Kublai Khan* established ties with the influential hierarchs of the *Mahayana* sect, *Sakya*, in Tibet. It was not until the sixteenth century when *Altan Kan* of the *Tumet*

devoted himself to the leading school, this strand of Buddhism had been actively spreading across Mongolia (Irina Morozova, 2003).

Mongolia has long been a land of varied religions, and Genghis Khan set a tradition of great religious tolerance. Mongolia religion was horrifically repressed during the communist era, but since the 1990s there has been a spiritual revival in the Mongolia. About 85% of Mongolians practice some form of Buddhism, Shamanism is practiced by a handful of ethnic minorities, and the 5% of Muslim Mongolians are from Kazakh tribes in the west. Christianity now holds about 10% of the country, with foreign missionaries of various denominations all vying for influence over the Mongolian people's beliefs (*A guide to Mongolia religion, online source*).

4.1.2 Religion with mixed cultures

Mongolia, in spite of being an inland country, has been, and is communicating with other counties as well as being influenced by them in many areas such as religion, economy, and culture.

It is known that in the 16^{th} and 17^{th} centuries, Mongolia came under the influence of Tibetan Buddhism. However now, the dominant religion in Mongolia is known as Tibetan Buddhism as well as Lamaism. Furthermore, while in the field, we can found that religion in Mongolia mixes many different kinds of cultures.

This temple, which should belong to Tibetan Buddhism faction (Photo4-1), is located in the Terelj tourist camp, about 100km east of Ulaanbaatar. Different from the temples in China, where many people come to pray in large numbers throughout the year, there are few adherents visiting here. The usage of this temple is not usually for praying, but tends to be symbolic in some ceremonies.

Photo 4-1 Mongolian temple located in Terelj tourist camp

Photo 4-2 Temple building

After a long walk, we reached the front of this temple. Here, I found many interesting things in this construction. First of all, we can see both an elephant carving, the representative of Indian culture, and a dragon carving, a Chinese symbol, in the same building. Based on this, there is no doubt that Buddhism in Mongolia includes both Indian and Chinese elements (Photo4-2); in other words, it suggests that both Tibetan Buddhism and Indian Buddhism have influenced the form of Mongolian religion.

However, compared with Indian elements, more Chinese elements can be found here. For example, besides the dragon carving, there are lion carvings and magpie

carvings (Photo 4-3). The latter one is a bird, which it's said can bring health and happiness to the people in Chinese fairy tales.

What made me more surprised is that I saw an Eight Diagram painted on the beam, which is absolutely a symbol representative of Taoism in China, even though the locals insisted that it just means two fish which can bring them luck. But I think it could be an Eight Diagram, and if so, that means there are two different religions joined in the same temple.

Photo 4-3 Magpie carvings in temple building

Through this temple, it's not hard to know how the past Indian and Chinese culture influenced the Mongolian religion which has mixed many different culture elements.

4.2 Water supply system

The water supply issue is one important process of water resource management which is usually overseen by government, and also can reflect the level of municipal facilities in a city. Ulaanbaatar, in spite of being the Mongolian capital city, is still facing many water resource problems. The system of water supply for a household in Ulaanbaatar is still in a very incomplete and faulty state. Through the internship, we saw many examples of that.

There were four locations we visited on August 30th. Except the third one, where we watched a regular hydrological measurement, the other three visiting gave us a chance to know the water supply system in Ulaanbaatar.

The first station was in a resident's house located in Goodoi gap, Sanzai area. Around the house we visited, there were many other houses too. But most of them are called summer houses, which mean the owner of this house only lives here in summer

Photo 4-6 Water supply station

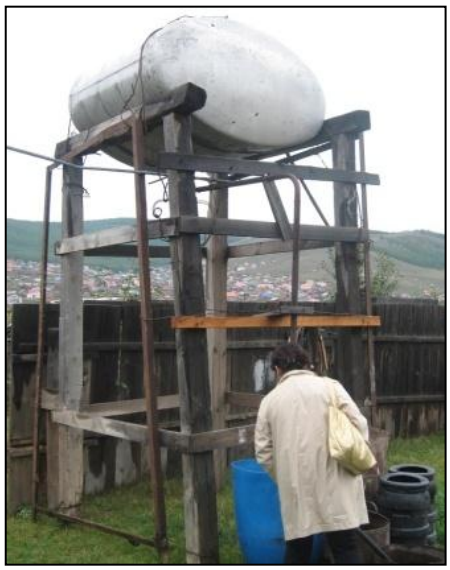

Photo 4-5 Water supply device in Local house

time, and they will move to another place when extreme winter comes because of the absence of a heating system inside these houses. However, the house we visited was a special type which meant they can live there all the year round. What surprised us more was that we were told that there is no running water supply system in some areas of Ulaanbaatar, and this area was also an example. Due to this reason, as we entered this house, a water tank placed on a high wooden shelf was seen (Photo 4-5). Now I can understand how important it is to this house. The water source comes from a well nearby at a depth of about 39m.

When asking our guide if each house had a water supply system like this for daily life, the answer was no, because the cost is beyond most of the residents. As a result, one of the ways of meeting water demand for these people is to buy water from the water supply station. The next we visited was such a station.

This water supply station located in the Sharga Morit area was the main water source for most of the people who live around this station (Photo 4-6). When the people want to get water, they take a big container for the water stored here. The guide told me the cost of the whole city's running water system is too expensive for the local government, so the water supply has become a private expense. Fortunately, the price of the water is cheap, which is approximately 4 Tugrik per 1 liter. As to the water quality, according to filed measurements, the EC and pH value is 300μs/cm and 6.8 respectively, which suggested a water quality neither good nor bad.

Another way of getting water resources for these people who have no water supply system is to get free water from places as such a spring where the water comes out from underground naturally. We visited two spring locations after we left this water supply station.

The first spring was located in the Sanzai area (Photo4-7A), which originates in a mountains area, then flows through this plain area, and recharges into the Tunnel River at last. Because this spring can be considered as a branch of Tunnel River, one of the most important rivers to Ulaanbaatar, Mongolian hydrological scientists chose here as a hydrological

A

B

Photo 4-7 The spring water for daily water demand

observation station. The workers responsible for this station will measure to acquire the hydrological data from this spring twice a day. Therefore, we also had a chance to see them work here.

The guide told us this spring is a very important water source for the residents who live along this river, but few of them will discharge the effluent back into this river due to a strict prohibition on doing that. However, we didn't see the residents living here get the water from this spring that day, but we saw them at the next spring location.

The next spring was in the Dambadarjaa area (Photo4-7B). During the short time we visited there, a large number of people came to take water. One big question related to using this kind of water source is pollution due to its exposed condition where the water can contact any kinds of contaminants, and it will be worse if heavy metal contamination were to occur.

We only saw the water supply system in Ulaanbaatar, but, perhaps, the situation of water use in other cities could be more serious, and it should be an urgent affair for the Mongolian government to improve their water supply system.

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5 Epilogue

Special and extreme climate conditions created the unique landscape-grasslands of Mongolia. For the tourist, they are beautiful and charming, but for local people, they are simply a part of their life, which has also determined their life style and use of space. There are still lots of problems that Mongolia has to conquer if they want to have rapid growth, such as the water problem, sanitary fittings, city planning, and some others. However, we think Mongolia is just standing at the

start of rapid growth, because the environmental problems haven't reached a serious situation yet. We believe there are still a chance as well as a challenge for Mongolia. The chance is that, in modern times, with more advanced technology and management modes than at any time before, Mongolia should have the ability to deal with various environmental problems. They can break the traditional development mode seen in western countries or Japan, which is to pollute the land firstly and then restore it. This is the challenge for Mongolia, which I think my country (I mean China) has failed in. Due to this, we have reasons to focus on this vast grassland country for a very long time.

Appendix

I. MEMBER LIST

Teachers: Dr. Takahiro Endo, Dr. Norio Tase, Dr. Maki Tsujimura, Dr. Naomi Wakasugi

Students: Kazuyo NAGAHAMA, Tatsuki SHIMIZU, Mizuho TAKAHASHI, Kohsuke TOMIMATSU, Wataru YAMADA, Wenyu HUANG, Maria Ludia SIMONAPENDI, Jie CHEN, Ishwar PUN,Jie ZHANG, Yingxin ZHAO

II. SCHEDULE Aug.27th ~Sep.3rd 2011

Sunday Aug 27 (**Venue:** Narita airport in Japan to Ulaanbaatar city in Mongolia)

11:15~11:30 Meeting at Narita Airport at Entrance of Mongolian Airline's Check-in Counter (H Counter, 4th Floor of the South Wing, Narita Dai-1 Terminal)

Departure	Destination	Flight	Flight time
NARITA 13:30	ULAANBATTAR 17:40	OM502	5:10

18:30-19:00 Arrive at Flower hotel and check in

19:00-21:00 Dinner time (Continental restaurant in the hotel)

Sunday Aug 28 (**Venue**: Baganuur city, Mongolia)

08:30-08:40 Departure from the Flower hotel to Baganuur city.
Responsible person: Mrs. Erdenechimeg.B. and Mr.Chinzorig.S

10:10-10:20 Coffee break on the way: bottled water, biscuit

10:20-11:50 Arrive in Baganuur city

12:00-13:00 Introduction about Baganuur coal mining activities in the room of an engineer of Hydrogeology, Mr.Tsogoo

13:00-14:00 Lunch time

14:00-16:00 Visiting Baganuur mining field area. (responsible person: Mr. Tsogoo–engineer of hydrogeology from the Baganuur mining company and Mrs.Unurjargal

16:00-16:10 Coffee break on the way: bottled water, biscuit

16:10-17:40 Visiting in experimental field area of MUST(Mongolian University of Sciences and Technology) , Mr.Nasanbayar.N (teacher of MUST) explained how to install equipment in the field area for research study. This field area is located 10 km from Baganuur.

17:40-18:00 Free time

18:00-19:30 Come back to Terelj lodge tourist camp

19:30-20:00 Arrive at Terelj lodge tourist camp

20:00-21:00 Dinner time

Monday Aug 29 (**Venue:** Terelj lodge tourist camp, Mongolia)

07:00-07:30	Wake up
07:30-09:00	Breakfast time
09:00-11:00	Visiting to the Turtle Rock (next gap near the Terelj lodge camp)
11:00-11:10	Coffee break, water and biscuit
11:10-13:00	Visiting piedmont of high rock mountain (to see the door of lama house which was locate on top of the mountain by digital camera with high resolution or binoculars.
13:00-14:00	Lunch time
14:00-14:30	Hotel room check in
14:30-16:00	Visiting to the small farm for cropping with irrigation system near Tsonjin Boldog, Genghis Khan Statue area.
16:00-18:00	Visiting the **Genghis Khan Statue** complex. This complex was located on the banks of the Tuul River, in a place called Tsonjin Boldog.
18:00-19:00	Arrived at Flower hotel

Tuesday Aug 30 (**Venue:** Sanzai area of UB city, Mongolia)

09:00-09:10	Departure time to the Sanzai area
09:10-09:40	Visiting the Dambadarjaa spring, The people of Ger area can use spring water for drinking and domestic use
09:40-10:40	Visiting the Goodoi gap in the north part of UB city. To see the production well of ger area
10:40-11:00	Visiting the Sharga morit area to see the production wells
11:00-11:10	Coffee break, water and biscuit
11:10-12:00	Visiting the hydrological observation small station in Sanzai gap area in piedmont
12:00-13:00	Visiting the production well locate in Sanzai area
13:00-14:00	Lunch time
14:00-14:40	Arriving in UB city
15:30-16:00	Arrived at the Flower Hotel

Wednesday Aug 31(**Venue:** UB city, Mongolia)

09:00-09:10	Departure time to the Termo Power Plant – III in UB city.
09:10-10:00	Visiting at the Termo Power Plant – III ,
10:00-11:00	Introduction about Utilization of Water for Termo Power Plant – III Engineer of water supply of TPP-III
11:00-13:00	Visiting the production wells and monitoring well of TPP-III
13:00-14:00	Lunch time
14:00-16:00	Visiting the famous Mongolian Cashmere shopping center of Gobi Cashmere Factory
16:00-18:00	Free time in UB city by bus
18:00-18:30	Arrived at Flower hotel

Thursday Sep.1 (**Venue:** Mongolia-Japan Center Building, P. O. Box 46A-190 Ulaanbaatar)

Opening Session

Chair: **Naomi WAKASUGI,** *University of Tsukuba*

09:30-09:40 Opening Remarks **Prof. Basandorj**
(IHP Mongolian National Committee)

09:40-09:50 Objectives of the Symposium
Maki TSUJIMURA, *University of Tsukuba*

09:50-10:30 Keynote Address
How to Cope with Groundwater Contamination by Nitrate?
Norio TASE, *University of Tsukuba*

10:30-10:40 Coffee break

Session 1 Environmental Problems in Mongolia

Chair: **Naomi WAKASUGI**, *University of Tsukuba*

10:40-11:10 Hydrology Systems, Specificity and Their Tendency of Changes in Mongolia
Gambo DAVAA, *Institute of Meteorology and Hydrology*

11:10-11:40 Flooding in Ulaanbaatar City and Reducing Risk Assessment Issues
Dambarajaa OYUNBAATAR, *Institute of Meteorology and Hydrology*

11:40-12:10 Studies of Arsenic in Mongolia
Idesh BOLORMAA, *Scientific Secretary of Institute of Public Health*

12:10-12:40 Water Use in Mongolia: Problems and Challenges
Lunten JANCHIVDORJ, *Institute of Geo-Ecology, MAS*

12:40-13:00 Discussion

13:00-14:30 Lunch

Session 2 Environment Diplomatic Leader Program

Chair: **Badamgarav ERDENECHIMEG**, Institute of Geoecology, MAS.

14:30-15:00 Environment Diplomatic Leadership (EDL) Program:
A New Integrated Capacity to Solve Global Environmental Issues
Maki TSUJIMURA, *University of Tsukuba*

15:00-15:30 Reconsideration of the World Population of the 21st Century
-Reproductive Health & Gender as a Key-
Naomi WAKASUGI, *University of Tsukuba*

15:30-16:00 A Legal Perspective for Surface Water and Groundwater Interaction: Groundwater Problem in Saijo City, Japan
Takahiro ENDO, *University of Tsukuba*

16:00-16:20 Coffee break

16:20-16:50 Discussion (including general discussion)
Chair: **Maki TSUJIMURA,** *University of Tsukuba*

16:50-17:00 Symposium Closing
Takahiro ENDO, *University of Tsukuba*

17:00- Leave for hotel and dinner

Friday Sep.2 (**Venue:** Mongolia-Japan Center Building, P. O. Box 46A-190 Ulaanbaatar)

Poster Session Dialogues with Young Scientists

Chair: **Takahiro ENDO**, *University of Tsukuba*

09:00-09:05 Objectives of the Poster Session
Takahiro ENDO, *University of Tsukuba*

09:05-09:10 Prospect of Success in Afforestation: Forest Management in India
Kazuyo NAGAHAMA, *University of Tsukuba*

09:10-09:15 Evaluation of Windbreak Trees' Transpiration and reduction of Evapotranspiration in Agricultural Field in Nile-Delta, Egypt
Tatsuki SHIMIZU, *University of Tsukuba*

09:15-09:20 Use of Geochemical and Isotopic Tracers to Assess Groundwater and Surface Water Interaction in Lebna Watershed, Cap-Bon, North-East Tunisia
Mizuho TAKAHASHI, *University of Tsukuba*

09:20-09:25 Understanding Groundwater Flow Systems in Semiarid Regions
Kohsuke TOMIMATSU, *University of Tsukuba*

09:30-09:35 Application of Life Cycle Assessment in Evaluation of Wastewater Treatment Process in ChongQing Province
Wenyu HUANG, *University of Tsukuba*

09:35-09:40 Forestry Management and Local Livelihood: The Impact of Forestry Management and Forestry Consensus by Government to Local Livelihood in Papua Province Indonesia
Maria Ludia SIMONAPENDI, *Uuniversity of Tsukuba*

09:40-09:45 Treatment of the Waste from Livestock Breeding
Jie CHEN, *Uuniversity of Tsukuba*

09:45-09:50 Cesium Analysis in Soil Water Kawamata Town, Fukushima
Ishwar PUN, *Uuniversity of Tsukuba*

09:50-09:55 Interaction between Shallow and Deep Groundwater in Baiyangdian Lake Watershed, China
Jie ZHANG, *Uuniversity of Tsukuba*

09:55-10:00 Study on Adsorptive Removal of High Ammonium Nitrogen of Organic Wastes Using a Novel Ceramic Adsorbent
Yingxin ZHAO, *Uuniversity of Tsukuba*

10:00-10:05 Modeling Water Quality Dynamics in a Tropical Inland Wetland: Case Study Abras de Mantequilla, Ecuador
Batdelger ODSUREN *Institute of Geoecology, MAS*

10:05-10:10 Modeling of Morphodynamic Effects of Dam Construction in the Tuul River of Mongolia
Sukhbaatar CHINZORIG, *Institute of Geoecology, MAS*

10:10-10:15 Assessments of Selenge River Water Quality in Mongolia by DPSIR Approach **Minjuur ENKHTUYA**, *Institute of Geoecology, MAS*

10:15-10:20 The Managed Aquifers Recharge Groundwater Resources for Water Supply ULAANBAATAR city.
Narantsogtyn NASANBAYAR, Hydraulics and Hydro Construction

	Professor Team, School of Civil Engineering and Architecture, MUST
10:20-10:40	Coffee Break
10:40-12:10	Poster Session
12:10-12:30	Clean up the room
12:30-14:30	Lunch
14:30-16:30	National Department
16:30-17:00	Arrive at Flower hotel

Saturday Sep.3 **(Venue:** UB city in Mongolia to Narita air port in Japan)

04:00-04:40 Departure from the Flower hotel to Baganuur airport.

Departure	Destination	Flight	Flight time
ULAANBATTAR 6:55	NARITA 12:30	OM501	4:35

13:30 Arrive at Narita airport and dissolution

Hotel Information: (1 MTG = 0.06 JPY, 100 MTG = 6 JPY**)**

Date	Hotel	Address	TEL&FAX	Approx. cost
Aug 27	FLOWER HOTEL	Bayanzurkh District Khukh Tengeriin 12 Ulaanbaatar 49	Tel: 976-11-458330 Fax: 976-11-455652	74USD/night/Single 79USD/night/Double
Aug 28 ~ 29	Terelj Lodge	Gorkhi Terelj National Park	Tel: 976 11 344488 Fax: 976 11 343757	49,000MNT/night with 3 meals (about 3,000YEN)
Aug 30 ~Sep 3	FLOWER HOTEL	Bayanzurkh District Khukh Tengeriin 12 Ulaanbaatar 49	Tel: 976-11-458330 Fax: 976-11-455652	74USD/night/Single 79USD/night/Double

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We are always remembering for their support and have to make effort to progress our each research. Moreover we are pursuing how to resolve our issues in the world and to be the environmental diplomatic leaders. We will work toward resolving our assignments with concerted effort to utilize our international network.

2011 Mongolia internship student group

2012-02-23