8. Environment Impact Assessment

8 Environment Impact Assessment

8.1 EIA Procedure and Results

8.1.1 EIA System in Mongolia

The Environmental Impact Assessment Law (EIA) of 1998, and its Amendments of November 22nd 2001, is the key law concerning environmental assessment in Mongolia, and is implemented by the MOE in collaboration with the Municipality. It requires EIAs and the obtaining of approval of environmental screening and environmental clearance before the implementation of major infrastructure projects. It stipulates that any projects or development initiatives are subject to Environmental Screening or Initial Environmental Examination (IEIA). The project proponent is required to submit summary and technical documentation to MOE in line with prescribed screening criteria; on the basis of which one of the following decisions will be made:

- To approve for implementation without further assessment, if the project impacts and consequences meet the requirements of existing environmental standards and requirements;
- In cases where negative impacts are deemed to be unlikely and / or insignificant project implementation may be approved subject to specific conditions regarding management and organizational measures to be taken;
- In cases where negative impacts are regarded as likely and or significant, the project may be required to undergo more detailed assessment or Environmental Impact Assessment (EIA).

If an EIA is required, the project proponent is responsible for contracting one of Mongolia's licensed environmental consultancy companies, of which there are more than twenty, to conduct the EIA in accordance with the requirements. Enforcement and monitoring of the implementation of Environmental Management Plans set out in EIAs are the responsibility of local government agencies.

The Mongolian Environmental Assessment Program (MEPA) is a comprehensive environmental and natural resource review process, with reviews at every stage of policy, program, plan and project development. Presently the Department of Information Monitoring and Assessment in the MOE is responsible for reviewing the Detailed Project Reports of all proposed investment projects and for establishing environmental category designation according to the law.

8.1.2 Procedure taken in the Study

The Screening and Detailed Environmental Impact Assessment is an assessment which should be conducted by the implementing agencies of the concerned projects. JICA Study Team, who is not the implementing body of the proposed projects, therefore, did not conduct Screening and Detailed Environmental Impact Assessment, but gave advice to the Government of Mongolia.

Consequently, the following procedure was taken for the approval of the EIA for the Narangiin Enger Disposal Site and Recycling Complex Development Project:

Initial Environmental Examination (IEE) was conducted by Ministry of Environment (MOE) on 20th June 2005 and the project proponent, MUB, was ordered to carry out Environmental Impact Assessment (EIA) according to the result of IEE. The MUB contracted out the EIA survey work to a local consultant, Agrar Co., Ltd.

Baseline survey started on 4th in August and continued until 17th in August, 2005. During the survey first Public Hearing Meeting was held on 9th August 2005 and comments from stakeholders including local residents were submitted by the end of August 2005.

The assessment of the impacts was carried out from 15th August to 15th September 2005 and a draft EIA report was submitted to MOE on 15th September 2005.

The second public hearing meeting was held on 19th October 2005 and comments from stakeholders including local residents were collected by the end of October, 2005.

The local consultant, Agrar Co., Ltd. revised the EIA report based on the instruction made by MOE and modified development plan of NEDS/NERC which took the comments from the public hearing meetings into consideration. Then the consultant submitted the revised EIA report to the MOE on January 11th, 2006.

After the examination of the revised EIA report, the MOE finally approved the EIA report of the development project of NEDS and NERC on February 6th, 2006.

The third public hearing meeting was held in 10th of May 2006 in order to explain the revised EIA report and development projects of NEDS and NERC. The results of the third public hearing were reflected in the proposed disposal site and recycling complex development project.

8.1.3 IEE

The Ministry of Nature and Environment has screened the project proposal on the establishment of the Disposal Site and Recycling Complex at the Narangiin Enger, Khoroo # 4, Songinokhairkhan District, Ulaanbaatar City submitted by the Governor's Office of the Ulaanbaatar City, and upon the completion of IEE, it concluded that the project has to be reviewed for the detailed environmental impact assessment (EIA) according to the Law on Household and Industrial Waste.

JUSTIFICATIONS FOR THE ENVIRONMENT IMPACT ASSESSMENT

1. Within the framework of the detailed EIA, there is a need to identify the environment impact of the planned disposal site and recycling complex, to clarify basic environment assessment of the proposed area, and to cover in the assessment;
2. After the identification of the condition for the soil contamination, it is necessary to plan preventive measures against soil and underground water contamination during the waste disposal process as well as to plan required funds for those measures, and perform a relevant survey on environment contamination status which must be reviewed by the MONE's authorized consulting organization/company;
3. To conduct detailed survey on the treatment of the leachate water and the water consumption at the Recycling Complex and Disposal Site, and introduce the relevant water utilization guidelines;
4. To draft Environmental Protection Plan and Environmental Monitoring Program, and plan budgets required for the implementation of those plans and programs;

5. During the EIA, there is a need to identify the best technology to be applied for the establishment of the disposal site and make necessary changes to the project draft and make justification whether there is a need to introduce a certain technology;
6. The project Implementer has requested to have EIA to be conducted (The date of official request: 16 June 2005, General Manager's official letter # 1/452).

OTHER ISSUES

1. To fulfill and implement additional requirements given by the local Government and environment inspection authorities promptly during the disposal operation;
2. To cooperate on permanent base with the environment protection and sanitary authorities in order to meet legal requirements of the environmental protection and proper use of natural resources;
3. To have a critique to be done on the EIA, and implement decisions of the critiques within the time specified in the IEE.

Evaluation has been performed by /signed/ S.Narantuya

MINISTRY OF NATURE AND ENVIRONMENT Ulaanbaatar City

Schedule and Directions for the Environmental Impact Assessment

Work Content	Duration	Note
1. To make video and photo pictures that show current conditions of the future disposal site, and attach them to the report.	During the beginning stage of the EIA	
2. To perform following additional studies and make conclusions in order to identify basic conditions of the surrounding land of the disposal site and environment protection measures: a. Water Issues: – identify in detail an amount and content of the leachate water, its treatment methodology and estimate the required funds for its operation, – identify methodology and costs for the leachate water treatment technology, defuse it according standards and norms, and introduce methods how to supply it to the waste water treatment facilities, – identify the conditions of the underground and ground water (surface), and to have a review done by the MONE's authorized consulting organization/company, and estimate in detail the water consumption amount and water source capacity, – identify the Landfill and Recycling Complex operation impact on water resources, its flow and quality, and draft its monitoring schedule and costing. b. Soil Issues: – identify soil contamination matters to be caused due to the disposal operation, ways to lessen and eliminate that impact, and estimate the required funds, – plan in phases the ways to rehabilitate the soil to be contaminated during the project implementation, and identify required funds, – conduct soil and permafrost survey and request to have a review done by the MONE's authorized consulting organization/company, – identify preventive measures against creation of many separate roads (single road must be used to access disposal site), soil contamination, and estimate required funds, c. Air Issues – identify the atmosphere content and its changes in the area of the disposal site, and identify possible impact on atmosphere due to the Recycling Complex operation, d. Other Issues – assess and identify sources for heating and electricity for Landfill and Recycling Complex, – include in the assessment in detail the ways to treat and dispose hazardous and chemical waste, – include in the assessment the issues how to treat the night soil of the workforce of the Disposal Site and Recycling Complex. – include in the assessment the ways to stabilize and hygiene the waste.	Starting from July 2005	To be conducted during the EIA

3. Draft Environmental Protection Plan and Environmental Monitoring Program.		During the EIA
4. Make an agreement to conduct Detailed Environmental Impact Assessments with a legal entity authorized and make a contract.	Within July 2005	
5. During the EIA to conduct public hearing meetings among local residents and authorities and include their concerns in the report.		During the EIA
6. Make an assessment on possible occurence of the accident during the disposal operation and natural disasters, identify ways to lessen and eliminate possible fire accidents, and include them in the report.		During the EIA
7. Provide with recommendations on standards and technology to be applied in waste recycling and landfill.		The same
8. EIA report that is done according to the Law on Environmental Impact Assessment must be submitted to the Ministry of Nature and Environment and to have a critique on the report. Follow the critique directions.	Within the 4th quarter of 2005	

In case of the failure to meet the above-mentioned timing for the required measures, the results of the IEE are considered to be invalid and the responsible one is to be penalized according to the Law on Environmental Impact Assessment.

IEE directions and schedule set by:
Expert of MONE /signed/ S.Narantuya
Responsible person who has accepted
results of the IEE its directions and schedule:
General Manager /signed/ G.Munkhbayar

8.1.4 Results of EIA

a. Contents of EIA Report

The table of contents of EIA report is as shown in the table below.

Table 8-1: Contents of EIA Report

1 PROJECT OUTLINE
- 1.1 Project Title
- 1.2 Project Objective
- 1.3 Project Implementing Agency
- 1.4 Project Site Location
- 1.5 Project Capacity, Basic Equipment
- 1.6 Project Site Location Map and Figures
- 1.7 Main Infrastructure Nearby Disposal Site

2 BASIC ECONOMIC DATA

3 PROJECT EQUIPMENT AND TECHNOLOGY
- 3.1 Project Equipment and Technology
- 3.2 Recycling Complex Basic Technology
- 3.3 Raw Material
- 3.4 Monitoring of Narangiin Enger Disposal Site

4 WASTE

5 SOCIAL ISSUES

6 BASIC ENVIRONMENT ASSESSMENT
- 6.1 Evaluation of Ulaanbaatar City Climate Conditions
- 6.2 Noise and Vibration
- 6.3 Geological Structure and Geomorphology, Hydrology Conditions
- 6.4 Earthquakes
- 6.5 Geomorphologic Conditions
- 6.6 Hydrographic Conditions
- 6.7 Hydro-geological Conditions
- 6.8 Seasonal and Perennial Permafrost
- 6.9 Soil Coating
- 6.10 Flora
- 6.11 Fauna

7 NEGATIVE IMPACTS OF THE PROJECT
- 7.1 Structure, duration and intensity of possible negative impacts on environment
- 7.2 Possible impacts by project implementation regarding the location of the project site
- 7.3 Possible impacts related to technical operation of the project

b. The Results

The parts of the EIA, Chapter 1, 2 and 3, are the extract from the study report. The remaining parts, except for The Project related Mongolian Laws and Regulations, are presented as follows:

Chapter 4. WASTE
Solid waste and leachate

- During the operations of Narangiin Enger disposal site, there will be some possibilities like emission of harmful gas from the waste before soil covering, burning of wastes, and polluting groundwater with leachate if there is a big amount of precipitation.
- During the operations of waste recycling complex there will be other possibilities like waste generation from separating operations that don't satisfy technical standards, leachate from washing the main raw materials such as paper and plastic bag, and harmful gas emitted during RDF production process.

Chapter 5 . SOCIAL ISSUES

On the 9th of August, 2005 JICA and Agrar company together have organized a public hearing meeting with Songino khairkhan district 4th khoroo residents in Khoroo #3 meeting hall and educated people on a waste issues. There were 70 participants present in the meeting and Mr. Delgerbayar from UB city Governor's Office has opened the meeting and commenced explaining about the current waste management conditions, projects that are going to be implemented with Japanese financing and JICA initiation, and the benefits that these projects will bring in terms of collecting, disposing, recycling the waste, and creating new work positions.

Next, Agrar company director N. Otgonbayar gave a clear explanation about the EIA that will be done, the meaning and the reason for EIA, what questions will be discussed in the EIA, and benefits and negative effects that recycling complex will create and how to decrease or avoid negative effects.

Figure 27. Meeting about developing a new disposal site and recycling complex and its EIA

Everybody who participated in the meeting has taken this project positively. After the meeting there was organized a question and answer section.

Question:
There is a certain law in Mongolia about protecting culturally significant places. Have you acquired permission from related ministry. It's possible that in Narangiin Enger there is cultural place. What will you do about it.

Answer:
Mongolian University Environmental school and us have cooperated to study all the 6 candidate sides for cultural heritage and places.

Question:
What will be the amount of methane if the recycling complex project will be implemented. How this will affect the environment and people. Is there any study done about this methane emission.

Answer:
Methane is a flammable organic substance that develop from kitchen waste (mixed with the air). According to the Study, 12.5% of total Ulaanbaatar generated waste in winter is kitchen waste and it is a very low level compared to other countries. Because 66% of Turkish waste and 30% of Tokyo waste is kitchen waste. Since 60% of Ulaanbaatar waste is ash thus methane will be in small amount. However we will continue studying during our project. We are planning to build gas removal facility even though the methane emission is low.

Question:
Can we drink from Tuul river near Biocombinat. Is there any analysis result?

Answer:
Tuul river is polluted at this area. Thus it is necessary to consume after analysis. It is done at the Central Environmental Laboratory. There are more than 20 factories in the factory region

that produce woolen and leather products. There is a study that these factories throw their liquid waste into the river without even an initial filtering. Actually these factories all should have a small scale sewer treatment facility. In near future, there will be implemented a project from Spain Government that will restore Tuul river and sewage treatment facility.

Question:
Will there be a monitoring works done near the disposal site.

Answer:
Environment protection plan and environmental monitoring schedule is usually developed and submited with EIA. These include the detailed guideline of analysis of air, soil, water, time and place of sample collection, and budget planned for these actions. Additionally, all the works related to environmental protection and the budget related to it is calculated and submitted. These costs are paid by the organization that is implementing the recycling complex project.

Appreciations:
It is time to organize the waste. We greatly appreciate all the related people from JICA and Agrar company who are trying to organize and clean the waste in our khoroo to create sanitary environment and conduct EIA. Additionally, we are happy that unemployed people from our khoroo will have jobs. We want to ask to employ more people from our khoroo in waste recycling complex.

Figure 28. Residents at Narangiin Enger

Chapter 6. BASIC ENVIRONMENT ASSESSMENT

6.1 Evaluation of Ulaanbaatar City Climate Conditions

Ulaanbaatar city is the biggest city of Mongolia. According to the latest statistics the population has reached 890.000 which are more than two thirds of whole country population.

The area size is 135.800 hectares; area with construction is 2600 hectares. Ulaanbaatar city is located between mountains, on the Tuul river basin and the ger area, which is rural area with traditional houses, are located in the northwestern, northern, and northeastern sides of the city in places called Bayankhoshuu, Chingeltei, Khailaast, Selbe, Uliastai and the area is expanding rapidly.

Several meteorological stations have been operating for different periods of time in Ulaanbaatar city since 1936 on Ulaankhuaran, Amgalan, and Khureltogoot mountains. Currently, stations are operating at Takhiltiin denj (to the west side of the city), University of Mongolia, Buyant Ukhaa, and Morin Mountain.

These stations mostly report Tuul river basin climate conditions but Tolgoit, Bayankhoshuu, Chingeltei, Uliastai don’t have meteorological analysis reports up till now.

The air pollution monitoring is done at the Environmental Analysis central laboratory near the Auto service factory, western crossroads, and Denjiin myanga and determines dust, NO_2, SO_2, and CO_2 amount in the air.

Additionally, there are mobile measurements of air pollution get completed. We have included the city climate, air pollution main reports for the past ten years in this study material.

Climate conditions and air pollution analysis

We have used Ulaanbaatar meteorological station at Buyant Ukhaa many years report.

Air temperature:

The winter is relatively cold, the average air temperature in January reaches -27.4℃, the warmest temperature reaches in July when the average temperature is 17.1℃. Any month from December to February in winter can have a temperature below -40℃ and the coldest temperature ever reached was -43℃.

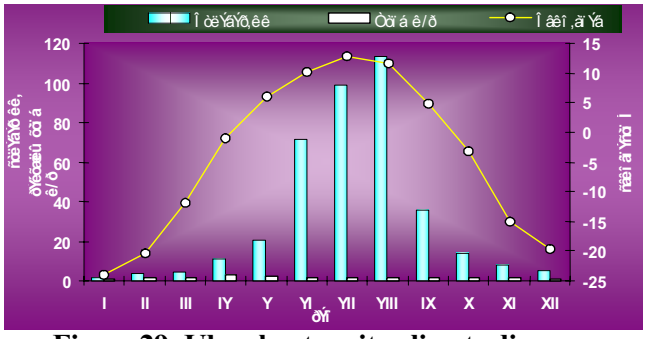

Figure 29. Ulaanbaatar city climate diagram

The highest temperature reached in July, when it reached +39℃. This shows the continental harsh characteristics. The number of days with an average daily temperature that is below -25℃ is 56 for one year for average. Number of days with an average temperature of more than +15℃ is 55 and warm period, which starts when temperature crosses above 0℃ and continues until it drops below 0℃, makes up 180 days.

For the past 30 years, the number of days when the air temperature reaches below -25℃ is decreased by 10 days and it shows that the winter is getting less harsh in connection with global warming.

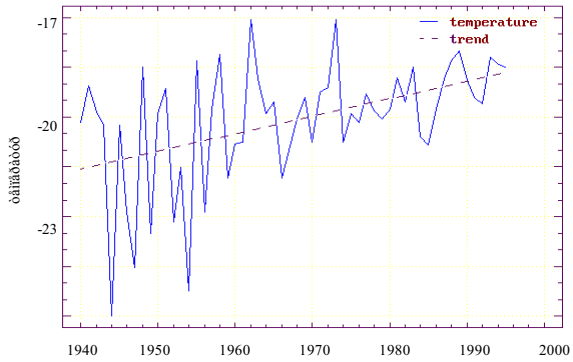

Figure 30. The average temperature for December for many years

For example for the past 60 years, in Ulaanbaatar, the average temperature for December can be said that increased by 60℃ (see Figure30).

Wind, air pressure:

Wind in Ulaanbaatar mostly blows from north and northwest. However it is totally different around mountain side, forest, ravines, and river valleys.

Mountainous valley wind dominates in Ulaanbaatar city during the winter times and from December until February the reoccurrence of southeastern wind reaches 49.4-57.2%. However in summertime the reoccurrence of north and north-western wind reaches more than 50 percent. Various wind directions during May-September period is shown in the 1st table below. Additionally, the wind direction reoccurrence for June and July is shown in the table 31.

Table 25 Various wind direction reoccurrence for 13 hour period (%)

	N	NE	E	SE	S	SW	W	NW	Reoccurrence of windless period
V	28.2	5.2	1.1	3.6	5.1	11.1	15.1	30.6	1.4
VI	27.1	7.7	2.1	5.7	7.4	10.6	9.6	29.8	2.8
VII	23.6	8.4	3.4	7.3	12.7	10.5	10.7	23.4	9.7
VIII	19.4	4.7	1.8	8.4	12.6	13.2	14.6	25.3	8.2
IX	24.2	4.2	0.0	4.5	8.7	14.4	17.2	26.8	7.8

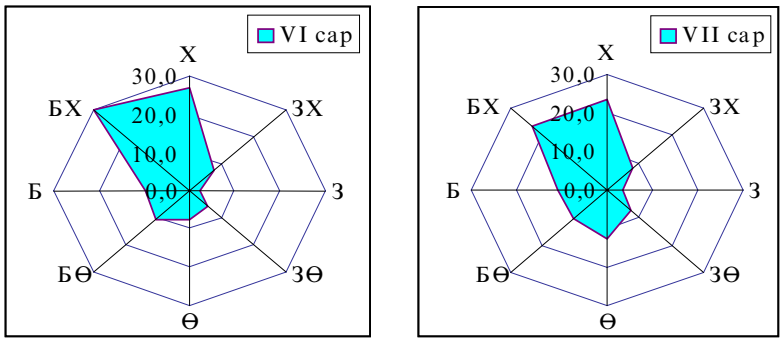

Figure 31. Wind reoccurrence of June and July

The average yearly wind speed is 0.9-1.5 m/s. The high wind speed occurs during April month of spring and it reaches 1.4-6.3 m/s, and in autumn, October it is also high reaching 0.8-4.7 m/s. The highest speed that sometimes occurs is 20 m/s but it's rare and number of days with wind speed more than 10 m/s is 7-10 days a year.

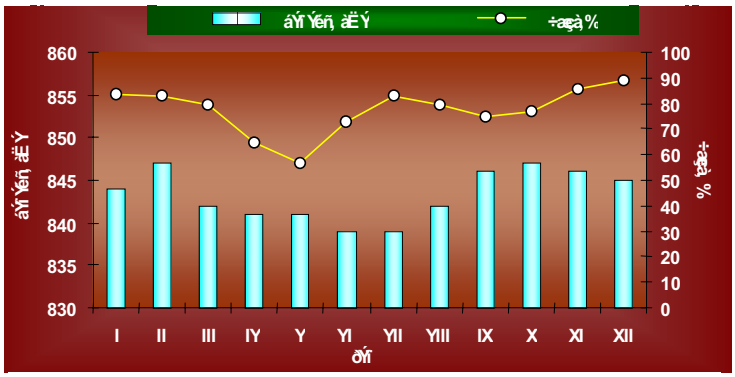

Figure 32. Air pressure and humidity conditions

The average air pressure in Ulaanbaatar city is 843 hPa (mercury level is 630 mm high) and it varies till 865 hPa in river valley areas. The air pressure in October and November is 845-870 hPa and in summer, July it is 840 hPa. The average change of air pressure overnight is 1-4 hPa (in 184).However there are 25 days a year that air pressure change reaches more than 8 hPa.

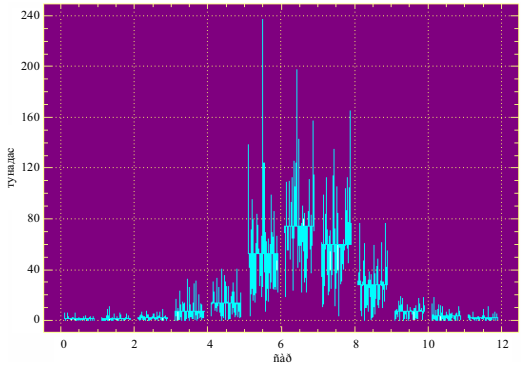

Figure 33. Monthly and yearly precipitation variation of Ulaanbaatar city

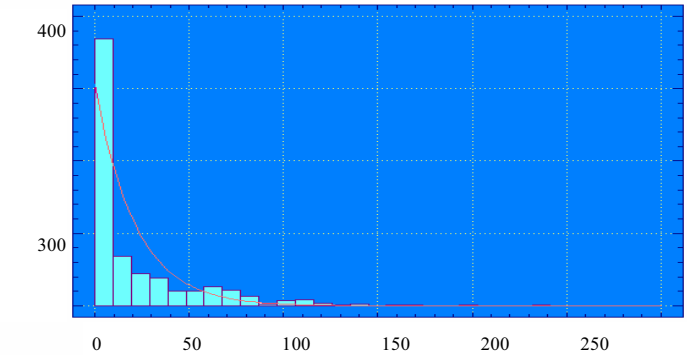

Figure 34. Monthly precipitation reoccurrence and distribution function of Ulaanbaatar city

Air humidity and precipitation characteristics:

Disastrous phenomenon originated in the air. Winter and spring months of 2004 was generally warm, summer months temperature was close to average, in July it was warmer than many years average and reached 32-39℃ in central regions, And in October-November it snowed a lot in central regions and it reached coldest temperature in November-December when it was colder than many years average.

The winter and spring of 2004 had more precipitation, summer and autumn was near many years average, November had more snow in central regions. This year the wind and storm was less and precipitation was more.

In Mongolia dangerous natural phenomenon originated in the air happens 25-30 times a year and more than one third of them becomes a natural disaster and causes 5-6 billion tugrik loss to the Government per year.

Since the 90's the yearly loss due to the temporary natural disaster reached 10-12 billion tugrik and it's connected to the less organized system of prevention against natural disaster and the increase of the collective wealth of the society.

On the 18th of July, 2003 at 4PM there was a flood that came down for 40-100 minutes. Measurement records say that Takhilt station recorded 22.7 mm precipitation, University of Mongolia station measured 54 mm and there was a rain with 45 percent of supply at the Takhilt urtuu and 8 percent at the University of Mongolia station.

The University station rain amount had a probability of occurrence once in 12-13 years thus it created very strong flood circumstances. The strengthening of the rainwater of the mud-flow flood that occurred in August 3rd of 1982 was 44mm in 20 minutes and in July 18th of 2003 was 9.7mm in 18 minutes by Takhilt station reports, 54mm in 100 minutes by National University reports and it was concluded that it had slightly less strength than of the 1982.

The flood amount was determined by perimeter intensity method that determines the highest amount of rainwater flood for the small rivers with areas that collect less water. It was determined that the mud-flow flood water that flown by had width of 7.75 meters, 43.12 cm depth, and the speed of 2.0 meters per second. The precipitation amount was 54 mm which was heavy shower that occurs once in 10-20 years with 5-10 percent supply and it caused mud-flow flood with the size of 8.0 m3/s. In the content of the mud flown by the flood, determined by cross section, there were around 5 percent of mountain rocks with the size of 5-10 cm, 3 percent of rocks with the size of 15-20 cm and the rest was 0-5 cm rocky gravel sediment. However, at the lower part of the cross section there was fine gravel sediment.

In Bayangol district, to the west of the Radio and Television Department, downward of the dam located at the last bus station of Zuragt in 1.5 km the measurement showed that rain water from Dalan davkhar north side has flown through east and western route and from the north side of the Bayankhoshuu road has flown southern valley water and combined. This water has filled the Zuragt new last bus station dam then it flowed out and flooded more than 10 houses and 2 mini buses. The volume of the passing flood water for this area was 16.00 m^3/s, the speed was 1.6 m/s, the average depth was 0.4 m, and the width was around 14.5 m. The soil that was carried by the flood was 2-10 mm high and it mostly consisted mostly from the rocky gravel deposits.

Relative humidity The relative humidity is around 50-60% in the warmest month around noon at 13:00 PM. The average yearly humidity reaches 70-75% and during the dry period of spring it is 45-55%. The average yearly precipitation is 240 mm and in some years it is much more or less than this. There is a general characteristic that 95-97% of precipitation falls in warm period and 75-80% falls during 3 months in summer.

Precipitation in winter is 1-3 mm and the highest reaches 100-120 mm during June, July, and autumn. 40-70 days per year have rain and 25-30 days have snow. 140-170 days are covered in snow with 0.17-0.23 g/cm3 density and 10-17 mm water reserve.

The possibility of a precipitation that reaches 120-130 mm per day is once in 100 years and 58-68 mm is once in 20 years. The average precipitation strength is 0.02mm per second and the highest strength of precipitation can reach 1.50 mm per second.

During summertime 30-40 days have lightning and the longest continuing lightning can occur for 130 hours. One lightning continues for 105-230 minutes on average. Some years have very heavy rain that cause flood and river water level increase. During dry and windy period of March-May and September-October when the fire possibility is high and it is necessary to take actions to prevent fires.

Air quality:

The air quality conditions of settled areas and a city. Currently, there are 3 power stations that use 5 million tons of coal and produce and emit in the air 200 different types of poisonous substances. Additionally, there are 250 small stations that use 400.0 tons of coal and there are 58 000 cars of 500 designs that emit smoke that contain carbon dioxide and heavy metal amount that is well above the naturally acceptable amount. These factors are the main sources of Ulaanbaatar city air pollution and additionally there are 85 thousand households living in ger area and burning more than 300 thousand tons of coal every year and 250 thousand cubic meters of wood causing heavy amount of poisonous gas that pollute the air that cause the health problems for the residents of the city. Due to the lack of the legal mechanism when the pollution generator pays the cost, this situation is getting out of hand and the air condition during the winter is critical.

During the analysis that was done on the 16 types of cars to determine the emission of the poisonous substances, 105 cars that made up 43.7 percent emitted ÑÎ and hydrocarbon with high level that was more than the standards of Mongolia. The carbonic acid and methane gas that are included in the content of the smoke coming out of vehicles with carburetor engine and the amount of grime that contains in the smoke coming out of diesel engine, and their standards, and technical requirements for the additional equipment that filters vehicle smoke and the standards of its utilization condition have been determined and are in effect.

There was organized an event to experiment the poisonous substance reducing equipment for cars /CAV/ on 500 cars and to install them to Ulaanbaatar city auto depot cars with diesel engine. The experiment showed that this equipment was designed to reduce the air pollution coming from the cars by 30-40 percent and to save gasoline by 5-8 percent. Thus the advertisement and the study materials of this equipment are developed and the publicizing has started.

The following is the 10 years monthly average air pollution records that was done at the Environmental Analysis Central Laboratory of Ministry of Environment and the standard air quality of Mongolia.

Table 26 Mongolian air quality standards

Substance name	Highest allowed quantity (mg/m3)	
	Highest for one time	Daily average
CO, mg/ m 3	5.0	3.0
SO2, mg / m 3	0.5	0.004
NO2, mg / m 3	0.085	0.067
Dust mg /m3	0.5	0.15

Ulaanbaatar city is located between mountains on the river plain and it's surrounded by ger area that use simple stove that burn coal during the winter times thus causing.

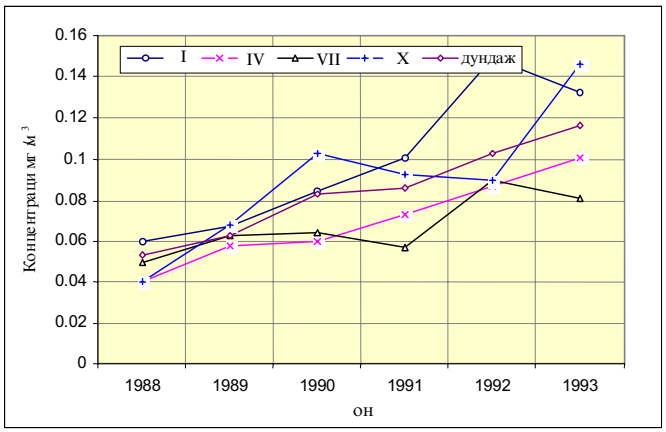

Figure 35. Progress of air pollution over many years SO_2

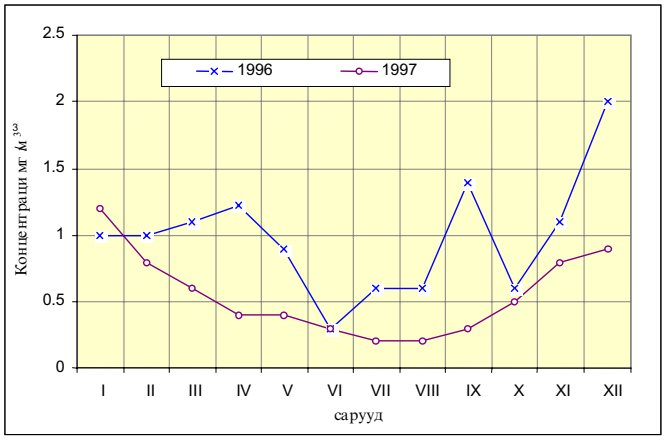

Figure 36. Progress of air pollution over many years NO_2

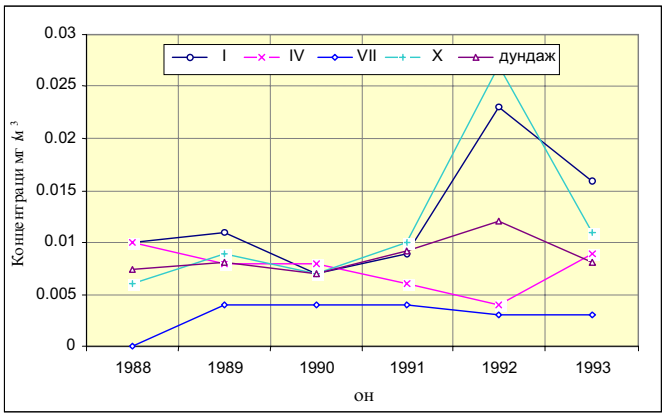

Figure 37. Ulaanbaatar city air pollution progress over many years
a. SO_2 b. NO_2 c. CO

Ulaanbaatar city air pollution through 1988-1993 is shown in the above Figure. Since 1994 method for determining air pollution is changed and started to record daily average sample. Before 1994 the air samples for taken 3 times a day at 18:00, 14:00, and 20:00 hours. Thus it is impossible to compare these records from before and after 1994 year.

The vehicle pollution records for 1994-1995 that were done at the laboratory of Ministry of Environment's Environmental Analysis Center from the point at Theatre of Classical Arts near the Sukhbaatar square are show in below Table 27.

Table 27 Amount of poisonous substance coming out of vehicles (1994-1995)

	SO_2 mg/m^3		NO_2 mg/m^3		NO mg/m^3		CO mg/m^3	Noise dB
	1994	1995	1994	1995	1994	1995	1995	1995
Theatre of Classical Arts	0.01	0.008	0.054	0.069	0.075		2.1	53

Environmental Analysis Central Laboratory has conducted an air quality analysis near the Ulaanbaatar city disposal site at Ulaan Chuluut and the new planned site at Narangiin Enger during August 27-30, 2005.

There are 4 points for air sample collection:

1. To the east side of the west side road of Ulaan Chuluut disposal site
2. To the south of the new disposal site
3. To the east side of the new disposal site near the asphalted paper burning place
4. On the new disposal site and the west of it

The content of the air has been defined aspirating 24 hours taking samples of sulfurate gas (SO_2), nitrogen dioxide (NO_2), TSP pollen/dust in an air.

SO_2 was determined by tetrachlormercury method, NO_2 content by Griss-Ilovski wet chemical method, TSP dust was collected by high volume sample collector and was determined by weighing method and the results are shown in the following table.

Table 28 The result of air analysis

Sample site	Month/day	Air temperature, 0□	Dust, mg/m^3	SO_2, mg/m^3	NO_2, mg/m^3
1	2005/08/27	+23	0.321	0.001	0.005
2	2005/08/28	+19	0.107	0.005	0.006
3	2005/08/29	+18	0.205	0.017	0.011
4	2005/08/30	+19	0.104	0.004	0.010
Air quality standard			0.150	0.030	0.040

Above mentioned table result MNS-4585-98 as it is shown in air quality standard of the city and settlement compared with the allocated amount of air pollution, shows the content of dust is more than allocated size of air pollution around nowadays working waste disposal site, at the west part of tar paper burning place-a new waste disposal site.

But the content of dust in an air is smaller, not crossed over than allowed standard at the south and west part of the new waste disposal site.

The content of sulfurate gas and nitrogen dioxide in all points were smaller than the maximum amount, close to Ulaanbaatar city background amount but in the areas where the asphalted paper is burnt, it is much more due to the waste in this area and reaches 0.017 mg/m^3.

Precipitation pH:

Environmental Analysis Central Laboratory of Ministry of Environment has been analyzing air quality by collecting air samples sinc1989. Precipitation pH analysis records show that Ulaanbaatar city average yearly amount of pH is 7.13, the lowest is 5.58, in Terelj it's 6.7, and the lowest is 5.22.

According to the reports that was released by the World Meteorological Organization in the areas far from the pollution source the pH is around 5.6.

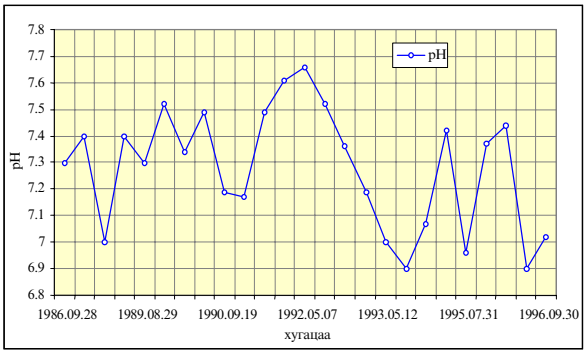

Figure 38. Ulaanbaatar city pH level

According the above Figure we can see that the precipitation in this region is not acidic but more alkaline.

6.2 Noise and Vibration

The measurement for noise and vibration is not conducted regularly in Ulaanbaatar city. According to the survey conducted on 23 July 1999, the noise and vibration pollution rate was at 67-72 db at the south side of the Ulaanbaatar Hotel and 65-72 db at the east side of the Hotel. According to the Mongolian standards the noise and vibration rate should not be more than 80 db in the streets and squares.

6.3 Geological Structure and Geomorphology, Hydrology Conditions

Geology structure:

By the geological structure, Ulaanbaatar city area belongs to the Hentii Geosynclinal system of the geology-tectonic category of Mongolia. The area's geology structure consists of lower carbon, lower cretaceous, neogene, quarterly sediment rock and lower mezozoic intrusive. The summary of the survey that covers areas of all districts of Ulaanbaatar city are included in this report. Since the issue is related in certain way to the subject, and surely future studies will highlight further details.

Lower carbon rock (C1)

Among the rock spread within the study area, the earliest one, the lower carbonate rock forms the geological structure of Bogd mountain North elevation and Tuul river North side mountainous range. The prevailing age of the rocks are aleurites, sandy rocks, conglomerates, gravel stones and jasper type silica stones.

Lower cretaceous rocks (K1)

Lower cretaceous rocks forms fulfilling Tuul river grabens that was known since its first geological surveys, and their surface at Tolgoit and Maanit hills. According to the lithologic content the rocks were classified as upper and lower 2 horizons. The conglomerates are prevailing in low horizon cross section that underlines its distinctiveness. The conglomerates are relatively well smoothed, and consists of the following rocks such as clear grey and greenish color, small grain size sand rock; dark grey, dark black phyllitic schist; greenish grey sericites; chlorite schist; brown red jasper type quartzite; dark grey color biotite-diorite; quartz porphyrite; felsite porphyrite; hornfels; milky color quartzite and etc. The conglomerates cemented loosely by clay with white, blond grey, green grey, dark grey color, and sometimes those clay, due to the ferrous oxide saturation, observed to become densely solid with corroded ferrous black brown color. The gravel size has comparatively different sizes and conglomerates form layers starting with big size gravel to the small ones.

At the cross section of the upper horizon, 0.2-2.0 m thick clay layers are placed between conglomerate and sandy rock layers, and that makes total cross section profile quite specific. The clay color is white, blond white, green grey, dark grey, yellowish grey, and density is quite high argillite type, and sometimes it forms plate type thin sheet.

Lower cretaceous rocks are formed in angle of 15-200 courses on the washed surface of lower carbon rocks that are underneath of the lower cretaceous rocks. The thickness of the lower cretaceous rocks is about 200 m by the drilling and geophysics survey.

Neogene sediment (N)

Neogene sediment is formed within range of Tuul river grabene, above lower cretaceous rocks, and ground surface occurrences occur in Tasgan Ovoo, Naran, Maanityn Ovoo,

Tolgoit, Ulaan huaran, Sharhad etc places. Based on survey done at the Tolgoit "Nairamdal" mining pit, the neogene cross section consists of the two rocks masses. Lower rocks mass has a conglomerate layer at its bottom containing brown color ferrous oxide cancrinite, and above that layer 16 m thick layer formed consisting of yellowish grey middle grain sandy rocks, gravel stone and thin dusty clay layer. Above this stripe color rock mass, red color upper rocks mass is formed. Its cross section shows that it starts with boulder type gravel sediment compacted with sandy rocks, and brown yellowish and red clay, loam that contain thin conglomerate layer. In the middle of the cross section, brown and red color clay, loam layers occur frequently.

Quaternary period sediment

In the engineering geology map of "Ulaanbaatar city area" from 1986 with the scale of 1:10000, the explanation had differentiated the origin of the mantle rock in the region and separated the quarterly sediment. These include 6 main, 5 mixed types of the total origin and determined the 4 period limits.

Each of alluvial sediment lower part of the Tuul river with middle-high quarterly period sediment, alluvium-proluvium sediments of bigger rivers, and fluvioglacial-glaciations originated sediment of Khurkhree valley were separated and determined.

The Tuul river valley sediment upper part, mountain foot deluvium and deluvium-proluvium sediment, alluvium-proluvium sediments of small valleys of mountains are classified and included in the high quaterly-holocene. The period classification of the side and top part of the mountain alluvium-deluvium sediment has not been done by entering into Holocene the Tuul river low and high alluvial land alluvium, thalweg, bigger valley proluvium and technogene sediment.

1. Alluvium-deluvium sediment geology-originated complex (eαQ)

Non classified quarterly period alluvium-deluvium sediment is widely spread in the valleys and sides of mountains with middle and lower height and it covers lower carbon crystall fundament. Side middle-low surfaces with smaller slopes that exist nearer to the sides and upper part of the watershed and lower carbon rocky surface surfaces directly and other parts that are near are covered with different thickness by deluvium, deluvium-proluvium sediment. The thickness of alluvium-deluvium sediment varies, in Bayankhoshuu and Maakhuur hills regions have 0.5-6.0 m thick and Buyant Ukhaa regions have 1.0-15.0 m thick sediments. The sediment content includes sand, gravel sediments compacted with loam, loam compacted with clast, and clay.

2. Middle-upper quarterly fluvioglacial sediment geology-originated complex (fQII-III).

Fluvioglacial-glaciations originated sediment occur in the deep estuary of the Hurhree valley. The data on structure, composition and characteristics of that sediment is rare and the ground surface occurrences are covered evenly with thin talus loam, and many big boulders occur often in surface.

3. Middle-upper quarterly alluvium-proluvium sediment geology-originated complex (ap QII-III).

Sediment rocks of this complex occur in Selbe, Uliastai, Tolgoit, Honhor grabene as well as Zaisan, Ih tenger and bottom of the Baga tenger valley. The sediment thickness is 17-30 m in Selbe, Uliastai, Tolgoit and Huliin river valley areas while it reaches 70 m thick in Zaisan valley's deep estuary area. It composed of loam, gravel loam, sandy loam containing clay soil layers, and gravel sediments compacted with loam. Clay sediment (loam, clay, gravel loam) with uneven thickness range from 0.5-4 to 8 m occur in the sides of Selbe, Uliastai, Tolgoit river valleys and at the narrow estuary of those valleys covering gravel soil compacted with

clay. Depending on clay soil profile and underground water level the sediment creates from weak to strong embankments. Gravel soil with small and boulder stones that compacted with sandy loam containing layers and lenses of loam sandy and loam with different thickness occur in above-mentioned valleys' elevated estuary areas (city center, Amgalan, Tolgoit valley estuary) and on the sides of the river.

4. Deluvium sediment geology-originated complex (QIII-IV).

Upper quarterly current deluvium sediment occurs on mountains' side, food and bottom sections frequently, and it covers alluvium-deluvium sediment and base rocks. The sediment mainly consists of gravel compacted with sandy loam, gravel, gravel sandy loam and loam. Sand may occur rarely and its thickness range from 1-15 m increasing from mountain side upper areas to the bottom area.

5.Deluvium-proluvium sediment geology-originated complex αpQIII-IV)

High quaternary modern period deluvium-provulium sediment that widely cover watershed lower side and wide mountain foot with less slopes. For example: it covers Nisekh, Yaarmag, study area northwest part that reaches Tuul river valley, these areas suit the most for building infrastructure because of its soil and environmental characteristics. The sediment content of this complex includes mainly loam, gravel particles compacted with sand, and sandy gravel.

6. High quaternary-modern period alluvium-proluvium sediment geology-originated complex (ap QIII-IV)

The sediment of this complex covers Chingeltei, Khailaast, and Bayangol valley. The thickness of the sediment at the mountain sides and valleys reach 10 meters or more and includes gravel loam, sandy loam and loam compacted stones in the gravel. The seasonal freezing depth is 2.8-4.1 m (first gravel loam, second loam compacted gravel).

7. Alluvium sediment geology-originated complex (aQIII)

The sediment content of this complex mainly include Tuul graben alluvium sediment high ñâèòûí high thick loam, sand compacted gravel and in other parts are (Tsagaan khuaran region) sandy loam, and loam compacted. Near the old ãîëüäðîêûí region, which is low flood plain and some valleys are covered with less thicker (0.5-2 m, sometimes up to 3 m) clay sediment.

8. Proluvium sediment geology-originated complex (pQIV)

Holocene proluvium sediment covers the bottom of gullies and ditches, and the mountain foot and builds modern sediment that consists of sandy loam, loam, and gravel. In the bottom of the ditch and gully there is gravel sand and sand, in drifts there are gravel and loam, in mountain foot and at the bottom of the bench there is gravel containing sandy loam and loam. Thickness is 1-3 meters at the beginning and the middle of the ditches and dams, in mountain foot and in the drifts it can reach 7 meters.

9. Technogene sediment (zQIV)

With the settlement and construction of Ulaanbaatar city, there has been developing lots of excavated soil. For example: at the Selbe valley end, in 12,15, 3, and 4th microregion, Tuul valley factory oriented districts can be mentioned. Excavated soil is spread on a land when activities like stopping the mountain side erosion and constructing buildings, leveling of the drifts, building ditches and roads, leveling up the old river basins, spreading soil that came from digging engineering canalization and building base, and growing plants and trees. The thickness of excavated soil cover can reach 0.2-2 meters in river valleys, and sometimes 4 meters, on mountain side with vertical planning 1-6 m, at the end of the leveled up ditches 10 m or more, and in waste disposal sites it reaches 5-15 meters. Excavated soil consists of different types of soil that contain household and construction waste and its density is

different according to the base soil main characteristics and context. The apartment area is covered with excavated soil with 0.2-1.5 m thickness because lately it is built as an apartment complex. The content of the excavated soil, its texture and characteristics, and space varies greatly. When constructing a building at river valleys it is necessary to create a layer of excavated soil at the area so that it is protected from erosions that river might cause, elevating it from the river level. Additionally, it will be protected from different kinds of physic-geological activities, water retention in the surface, and developing a swamp. However, when dealing with mountain side, excavated soil at the ridges and other erosion systems that were created during the construction should be leveled up otherwise it will be eroded by the river.

Intrusive rocks:

The intrusive rocks occur rarely in Ulaanbaatar area and only early Mesozoic granite massive occurs in Bogd mountain northern side. Granite-porphyrite occurs in the side parts of the massive and small and big grain, pinkish grey color granite occurs in central parts. This massive forms cupola type two-phase gypasial intrusive, and porphyrite type biotite granite was formed in the first phase and leucocratic granite was formed in the second phase.

Tectonics:

Tectonic structure of the Ulaanbaatar area is directly linked to the development of the Hentii mountain range's neotectonics, and the general profile of the neostructure is formed by Ulaanbaatar graben and its surrounded block type elevations.

Concerning the tectonic structure, the study area formed by simple and pre Mesozoic and Mezso-Cenozoic structural layers.

Pre Mesozoic structural layer form study area's crystal foundation and its composed mainly by lower carbon residual rocks. The layer basically cut by tectonic fractures to the North East and North West directions and internal structure became solid.

Mezso-Cenozoic structural layer is formed on the basis of the crystal foundation and it basically occurs in big rivers' grabene type valleys. The internal structure of this layer composed of lower cretaceous, neogene, quarterly structures and formation complexes.

Early Mesozoic intrusive complex formed independent structure in the study area's tectonic structure.

The deep fractures form the Ulaanbaatar area's tectonic structure and structural layers are split by deep fractures. The Ulaanbaatar city area belongs to the 5-7 degrees of earthquake magnitude.

6.4 Earthquakes

The earthquake and vibration zones of Mongolia were determined in 1985 according to the study that was done on Central Asia and Mongolia. Based on this, most part of the Mongolia was determined to be included in the highly vibrating region and the vibration period and place distribution characteristics were determined in detail. Additionally, the high vibrating-fracturing and vibrating zone of the country was mapped in Figure.

Before this work, in 1959 Russian expert V.P.Solonenko has developed the first schema for Mongolian vibration zones which became the source for writing a book "Ulaanbaatar city vibration zones". This book has included wide range of useful information such as Mongolian and Ulaanbaatar city vibration and earthquake related study material, summary, additional materials, sketch maps, and city planning advice.

Based on this result, the map of Ulaanbaatar city vibration zone was developed which divided the area into 3 regions with 6, 7, and 8 scales of strength. According to the above, in the region with the scale of 6 include Tuul river south and north valleys (10, 12, 15, and 16th micro regions). These areas have palezoin sandy loam and schist type rocky geological formation and the groundwater is reached in more than 5 m below and the land slope is 50 and more. These regions are considered to be less dangerous.

In regions with the scale of 7 include Bogd mountain north side with sudden slope that have dry debris and loam soil, Tuul valleys with main rocks on which there formed 20 m gravel and sandy soil and the groundwater in 5 meter depth (19, 1, 2, 5 micro regions and some parts of 6, 13, 14 micro regions), and Tuul river valley and mountain foot with less slope (16, 17, 18, and 8th micro regions and north part of the 13,14th microregion), Selbe and Uliastai riverhead (7, 9, 11th microregion and some parts of the 10, 6th microregion). This area is considered to be medium vibrating impact regions.

The most dangerous in terms of vibration, area with the scale of 8 include swampy areas along rivers Selbe, Uliastai, and Tuul and regions near to the river banks (some parts of 9, 7, 10th micro regions).

6.5 Geomorphologic Conditions

Ulaanbaatar regions includes formation originated tectonic-denudation, denudation-deposit, deposit types.

The region we are evaluating has a fairly simple geomorphologic formation but to determine its characteristics and dynamic variation the morphology of Tuul river is very important. Thus the main elements of morphology of Tuul river is determined the following way.

Table 29 Main morphological elements of Tuul river

	Tuul river flood-plain name	Height, m	Age
1.	Low flood-plain	1.5	QIV
2.	High flood-plain	3	QIV
3.	I terrace above the flood-plain (Amgalan)	5	QIV
4.	II terrace above the flood-plain (Ulaanbaatar)	8-9	QIII2
5.	III terrace above the flood-plain (Zaisan)	11-12	QIII2
6.	IV terrace above the flood-plain	15-16	QIII1

The formation origin type of tectonic denudation include Bogd mountain north side and other river valley tectonic transmissions, denudation type include watershed high surface and upper side, denudation deposit type include aggradational type: watershed middle-lower side and deluvium-proluvium sediment covered area, and deposit type include river valley.

6.6 Hydrographic Conditions

Water reserve, regime, water supply, and change in reserve

Mongolia is a high plain country located in the 3 big continental water divide. Thus water cannot be retained, much of its rivers flow out of country's boundary and these factors make the country one of the countries with the lowest water supply. Mongolian water supply mostly consists of surface water and over many years it has been calculated and for past 20 years was considered that the average river flow reserve is totally 34.6 km3, underground water reserve reaches 6.1 million cubic meters. Only 36.7 percent from the above mentioned reserve amount but more than half of the total livestock are allocated to the steppe and dry Gobi area which take up two thirds of the whole country land area.

For the first time water reserve calculation was conducted in July of 2003 and continued for 3 months and encompassed capital city and 21 aimags' 334 soums and 150 people worked as 10 groups. This water reserve determining works were conducted according to the management and methodology and surface water of every aimag was measured and filed into a report and computer program and established a an information fund of Geographical Information System. According to this water measurement activity that was conducted throughout the whole country there are total of 5097 rivers, 9582 underground well and from them 372 rivers and 1158 wells were dried out. From here we can see that total of 1530 water points were completely disappeared.

Big and bigger rivers flow through several aimags and medium and smaller rivers flow through several soums, and smaller rivers flow through soums and one river is double counted in several aimags thus the reports show numbers of rivers more in bags than soums, and number in soums is more in aimags, and number of rivers in aimags are more than the state. Thus in the report counting rivers of the country the river is not double counted thus making more accurate count.

Aimags in the surface water count summary have 5153 rivers from which 372 have dried up, from 9582 wells and springs counted 1158 have dried up, and from 3854 counted lakes 573 have dried up. For the state level, from total of 5097 rivers counted 372 have dried up, from 9582 wells 1158 dried up, and from 3848 lakes counted 573 have dried up.

Table 30 Summary of the count of surface water of Mongolia /2003 year/

Aimag name	River		Wells and spring				Lake	
	total	dried	total	dried	total	dried	total	dried
Arkhangai	546	124	474	123	31	3	249	32
Bayan Ulgii	293	17	736	42	13		1180	217
Bayankhongor	299	61	837	55	22		104	38
Bulgan	449	62	668	238	36		254	27
Gobi Altai	219	2	779	35			75	0
Gobisumber	3	0	19	1	2		1	0
Darkhan Uul	21	4	27	13			4	2
Dornogobi	0	0	345	50	4		1	0
Dornod	156	39	354	121	24		515	233
Dundgobi	1	0	187	15	5		12	0
Zavkhan	217	19	444	18	15		118	2
Orkhon	5	0	28	7			4	1
Uvurkhangai	294	51	530	97	37	3	110	20
Umnugobi	2	1	559	20	5		18	0
Sukhbaatar	35	22	368	41	6		55	4
Selenge	596	90	208	70	28	2	46	6
Tuv	537	94	413	103	17	1	235	72
Ulaanbaatar	72	22	106	22	20	1	4	1
Uvs	183	0	493	31	16		121	6
Khovd	214	7	468	10	9		201	4
Khuvsgul	1233	70	969	193	78		642	30
Khentii	246	17	588	179	6		247	65
Total for aimags	5621	702	9600	1484	374	10	4196	760
Total for county	5565	683	9600	1484	374	10	4193	760

In Ulaanbaatar 22 rivers, 22 wells and spring, spa 1, and 1 lake have been dried up.

Changes occurring in water condition and their reasons: One of the basic ideas of sustainable development is to use water according to its resource regeneration rate, develop economic system that protect the areas and its surrounding environment that have great impacts on the decision of water resource utilization.

With the expansion of the society and economy the water usage increases constantly. However the water resource regeneration happens in the nature but with limits. Thus to keep the sustainable condition of river ecosystem and social and economic development it is necessary to utilize the water resources correctly and protect it from pollution.

Environmental composite factors like basin weather conditions, soil, flora, hills and depressions, geological formation and human direct or indirect activities attribute to the changes that happen with water resources and quality. The direct human activity impact includes population expansion, mining, industrial activities, factories, farming, and utilization of water, fauna, and mineral resources. Indirect impacts include global and regional climate change and environmental pollution that moves from one location to another.

Due to human direct impact the forest resources decreases, soil gets compacted, flora classification decreases. Water regime, resource change, pollution, decrease, elimination, or emigration of water animal and plantation species happen because of these impacts.

Study of water regime and resource change: Most of the Mongolian water supplies are done by the underground water which has a hydraulic connection with the river water. Experts prove that underground water supply is decreasing because of water usage and river regime and its surrounding environment.

In settlement areas the environmentally sustainable relationship of soil water thus causing the decrease of the steam coming from subsoil which in turn cause humidification in air circulating region and increase of the groundwater level. The increased groundwater causes buildings dampen from the bottom; in the capital city the underground water level has increased by 0,5-0,8 meters since 1980 and its yearly variation reaches 1,0-2,0 meters. Scientists are claiming that Zuun ail, Nogoon lake, Bayankhoshuu area swamps expanded greatly and because of soil covering the west Selbe river flow the underground level of Enkhtaivan Urgun Chuluu street and caused pipes and canalizations to be flooded making changes in city planning strategies necessary. Thus it is necessary to establish a constant monitoring system of underground water of our country and monitor underground water and changes happening with hydraulic and non hydraulic connections, create water usage information fund with necessary information about Ulaanbaatar city underground water supply, resource usage evaluation, future city plan in connection with water usage, and water analysis.

If we look from the hydrology side, the conclusion would be that Ulaanbaatar city water supply is coming from the quaternary period regolith containing underground water. Due to the increased construction works the decrease and pollution of groundwater is increasing causing Tuul river and regolith sediment subsoil water level to drop and stop supplying water which causes Tuul river water flow to decrease.

River water regime

Tuul river nourishment 25 percent is subsoil water, 6 percent is melted snow water, 69 percent is precipitation water and it is counted as a river with spring melted snow water regime and summer precipitation flood regime. The main factor making up the Tuul river flow is precipitation. Since the main feeder of the river flow is summer and autumn precipitation the water level is very unstable. By the end of April and the beginning of May there is a flood caused by melted snow but the duration and the amount of water is not that much. After the spring snow water flood there is dry period for a while until July and from July until September the water level increases rapidly. The highest level of precipitation flood is 1.5-2 times more than highest level of spring snow flood. After the precipitation flood

period finishes the water level gradually decreases and reached the winter dry period and continues throughout the river icing phenomenon.

River icing period starts from the last ten days of October and completely freezes in second 10th day of November and continues to have frozen cover until the end of April, totally continuing for 122 days.

To calculate many years average flow of any river, it is necessary to include one or more phase that covers river's biggest and smallest flow years. This will be closer to the river's many years real value of natural process according to the possibility theory.

According to Ulaanbaatar guard flow materials for years 1945-1995, Tuul river had small flow in 1945-1957, much flow in 1958-1975, small flow in 1976-1980, and through 1981-1995 it had much flow.

Additionally, two full phases can be seen that will show the average flow for 1945-1975, 1976-1990. Including these two phases, Ulaanbaatar city Tuul river many years norms and its statistic index can be calculated to be Q= 25.4 m^3/s.

Maximum flow: The maximum flow happens during spring snow flood and summer precipitation flood. Precipitation flood is several times more than snow flood in terms of time and amount. Due to many days rain the flood continues for a long time and the flow is usually highest in July and August. Average period of Tuul river flood is 14 days and increases for 5 days and decreases for 10 days. Tuul River was in 1966, 1967, 1982.

Minimum flow: Tuul river has minimum flow two times a year. Depending on the current year's precipitation, the minimum flow time and amount varies and in some years it's 2-5 times/ year. The first minimum flow happens during April end, for 10 days, May, and for latest-October. The average duration is 30-50 and it can reach up to 80-100 days. The minimum flow of Tuul river around Ulaanbaatar city is Qmin= 15.6 m^3/s.

The winter minimum flow starts at the end of October or the beginning of November when the ice cover develops and continues for 120-160 days. In some years, it starts at the end of November due to summer precipitation amount.

Flow distribution in one year: Tuul river yearly flow distribution is very unstable, 90-95 percent of the yearly flow is during summer and for winter times, the smaller branches and shallow places freeze. The yearly flow distribution according to Hydrology material for 1945-1995, is shown in the table 38 below.

Around 20 percent of Tuul river flow is spring flow and 70-75 percent is summer flow. For smaller flow years, only 7-9 percent happens in autumn and winter.

Table 31 Tuul river flow classification for one year

Unit: %

Current	Month											
	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III
Strong	0.6	5.9	14.5	22.7	39.4	9.2	6.1	1.25	0.19	0.03	0.02	0.01
Medium	0.5	8.9	11.4	31.2	21.2	17.8	7.1	1.7	0.16	0.03	0.1	0.0
Slow	1.9	7.0	11.3	33.7	29.0	15.1	6.1	1.75	0.1	0.02	0.1	0.0

Chemical composition and water pollution main conditions

Tuul river gets the most impact from human activities among all our country rivers. Thus Tuul river can be divided into 3 main parts by the characteristics of human impact:

Not impacted by human activities or the upstream part-from the riverhead to Nalaikh, middle part which is impacted by human activity the most-from Nalaikh to Altanbulag Soum Bridge

and downstream part that is possible to be polluted further with human activities-from Altanbulag soum to the part where Tuul flows into Orkhon River. The reason is that population is sparse in the upstream part and these several families settle near the river only during summertime. However Tuul river is the main water supplier of the capital city and the area where the project is planning to be completed contains a water part that is considered to be upstream for Ulaanbaatar city household and sanitary water supply. Fully or half filtered sewage treatment water flows directly into the middle part of the Tuul river from Ulaanbaatar city five central sewage treatment facilities for all districts and regions of the city

Thus Tuul river pollution level is 5, which is ten times more than allowed amount. According to 2002-2003 examination results 47% of the polluted water flowing into Tuul is factory liquid waste, and the rest 53% is household sewage water. The central sewage treatment facility cannot fully filter and clean the chemical components of some factories' waste thus they cause huge pollution to Tuul by dumping half filtered sewage water into it. It is mentioned above that our country is using underground water in big quantity is causing a big change in the reserve. Thus, it's necessary to find a correct way to solve the residents' water demands and make a change in the Tuul river water regime and build a bigger reservoir to support its riverhead.

More than 10 springs and wells were restored and taken into protection in Gunjiin bulag, Bumbat, and Dambadarjaa to decrease water pollution, supply all residents' with clean drinking water and were handed over to the Governor's of the districts. During 2-3 years nearly half billion tugriks were spent yearly from the Government budget on restorations of wells and irrigations in the countryside.

Chemical composition

Surface water chemical composition is determined by main ions such as Calcium /Na^{2+}/, magnesium /Mg^{2+}/, potassium /$Na^{+}K$/, hydro carbonate /HCO^{3}/, sulfate /SO_4/, chlorine /Cl-/. These vary in amount depending on the geography, mountain rocks, and climate conditions but in some areas it is constant. The main ion content amount is a factor that can show many water usage characteristics like surface water pollution.

According to examination results of years 1945-1994 in Tuul river water, the dominating cation was calcium /Na^{2+}/ by its amount and dominating anion was hydro carbonate /HCO_3/ - and the cation relationship was Na^{2+} >Na+K > Mg^{2+} , anion relationship was HCO_3 > SO_4 > Cl. This is similar to other world's clear river water chemical composition and ion relationship.

However beyond the area where the polluted water coming out of Ulaanbaatar city Central Sewage Treatment facility, for about 50 km away, the main ion's content increases rapidly and the relationship changes. For example, Na+K- content increased 4 times, Cl- 6 times and the cation (positively charged ion) relationship changed into Na+K > Na^{2+} > Mg^{2+}, anion (negatively charged ion) relationship HCO_3 > Cl > SO_4.

Table 32 Tuul river water main ion's average content over many years

Monitoring point	Mineralization	Na^{2+} mg/l	Mg^{2+} mg/l	Na+K mg/l	HCO_3 mg/l	SO_4 mg/l	Cl mg/l
Uurbulan	65.9	8.7	2.2	7.7	38.6	7.8	4.7
Nalaikh	95.7	13.6	3.7	9.7	52.9	9.0	5.7
Bayanzurkh	84.8	10.5	2.7	9.4	45.1	5.4	5.3
Zaisan	106.0	12.8	3.5	15.3	65.1	9.3	8.2
Sonsgolon	100.3	14.3	2.9	12.0	51.7	12.3	7.3
Songino	210.1	24.6	4.8	37.3	76.6	30.6	42.5
Shuvuu	191.3	21.6	4.9	29.9	72.0	25.5	35.1
Khadankhyasaa	180.4	22.6	5.9	25.6	76.4	21.4	29.6
Undurshireet	127.0	15.0	4.2	16.3	64.6	17.0	10.4

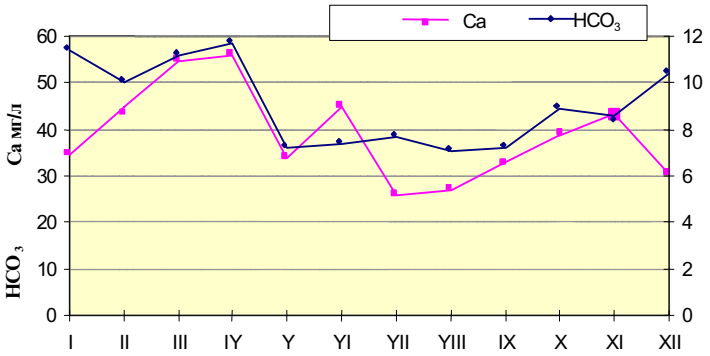

Figure 39. Tuul riverhead area calcium, hydro carbonate ions' yearly distribution

Classification of the main ion during a year

Yearly changes of Na^{2+}, Na+K, Mg^{2+} and HCO_3, ions that are connected to mountain rocks, have seasonal characteristics and it is constant throughout the river length.

In other words the content of these ions depreciates during May-October when the water level rises and increases when the water level drops. The highest content is during the last month of winter just when the ice starts to break to melt and the lowest is during the summer months of July and August when the water level is highest.

Water quality classification of Tuul river

Tuul river water quality examination for 1998 is shown in the table below.

Table 33 Water quality index sampled from 6 km upstream Tuul river bridge (1998)

Water quality	1	2	3	4	5	6	7	8	9	10	11	12	Average
pH	8.1	8.3	8.6	7.4	6.8	-	7.2	-	7.1	6.8	6.9	-	7.5
Chemically necessary oxygen mg/l	1.1	0.2	6.0	3.3	2.7	-	2.3	-	5.0	3.0	2.7	-	2.9
Biologically necessary oxygen mg/l	1.6	0.5	1.0	2.7	2.7	-	2.3	-		3.0	2.7	-	2.9
Solids mg/l	3.9	17.0	0.6	0.8	6.6	-	-	-	13.2	7.2	15.4	-	8.1
Minerals mg/l	68.6	104	165	106	47.6	-	61.2	-	37.6	57.6	74.4	-	80.1

It is shown that Tuul river is neutral for pH indicator around this region and other indicators show little worse situation in winter time but overall it's comparatively good.

6.7 Hydrogeological Conditions

Based on geology development history within the Ulaanbaatar city area, the rock collector composition can be divided into the following layers as the quarterly regolith sediment hole pore and hole pore-layer, neogene hole pore-layer, lower cretaceous crack-layer, carbon sediment, reef altering rocks and intrusive rocks crack-underground water sediment as well as tectonic cracks-water way belts. Also there are water-bearing horizons formed above permafrost rock and clay sediment thin layer in the northwest and northeast area.

Based on rocks origins underground water of quarterly regolith sediment hole pore and hole pore-layer can be examined by dividing them as water horizons and complexes.

1. The biggest by area the Tuul river valley with its affluent river banks Tolgoit, Selbe and Uliastai is included into the present quarterly alluvium, proluvium water horizon (ap QIV).

The water layer is identified as 50-60 m and flood-plain height is about 5-10 m. The underground water occur 0.5-4.0 m below ground surface and 1245-1320 m at absolute

height in summer season. The main direction of flow is along valley, from east to west direction, and surface inclination is 0.004 in Amgalan urban area and 0.001 in Songino area.

The main source of the water horizon is the water of Tuul river and water of Tolgoit, Selbe, Uliastai rivers flowing from the West as well as precipitation is another source. During winter and spring season the water horizon is filled from water in cracks and watered complex cracks. Rocks containing water is full of gravel with boulder rocks, small and middle grain sand, and thin clay sediment layers compacted with rear loam sand and loam. The aquiclude or the lower boundary of water horizon is of the neogene period and has red color clay.

The permanent discharge of the above water horizon is 0.16-53.3 l/seconds, and the discharge rate is from 0.10 to 28.7 l/seconds as water level goes down gradually from 0.65 m to 12.7 m.

2. The water horizons of the middle and upper quarterly current alluvium, proluvium and deluvium-proluvium sediment belong to Tolgoit, Selbe, Uliastai, Zalaatyn am, Yarmaggin denj areas that are stretch in Tuul river valley.

Water layer thickness in the Tolgoit river valley is 18-30 m, and it becomes 1.0-3.0 m thick at perennial permafrost rocks. The upper boundary of the under ground water occur 0.5-7.4 m deep from surface level, and its specific feature is that it becomes slightly pressurized (0.5-2.0 m) in some areas in winter and summer. The main flow direction is from North to South.

The water horizon's main source is Tolgoit river, water bearing complex chapters of Paleozoic period, and precipitation that depends on season. The water bearing sediment mainly composed of gravel compacted by sandy loam and loam, poor smoothed gravel, sandy loam and loam containing boulder stones. The upper boundary of the sporadically spread perennial permafrost soil rock is changed due to the many railway dams, heap and dug holes that impact on balance underground water level, thus causing conditions of the surface somewhat difficult.

The permanent discharge of the water (in the area without perennial permafrost) is 0.8-3.6 l/seconds, and the discharge rate is from 0.02 to 0.7 l/seconds as water level goes down gradually from 0.4 m to 1.8 m, which confirms the water yield is low. Springs' discharge that located along Tolgoit river is 0.7-1.7 l/seconds. Those springs cause water to flow over melting ice in winter and later in summer, it makes area swampy.

The sediment layer above perennial permafrost rock became pressurized in winter season that form humps (40-150 m) with 0.8-2.4 m high, and water flow out from hump cracks causing water to flow over melting ice.

The water horizon of unclassified quarterly alluvium-deluvium sediment occurs in the southwest of the study area that is the airport area, in the northeast of the study area that is area of Sharhad and 16th micro district. The water horizon occurs in some places under the thin present quarterly sediment.

The thin water horizons (2-4 m) occur mainly in the weathering layer of basic rock and sandy narrow layer of clay sediment, and they are formed in "hanged" position without any consistency.

The main source is springs' crack water, and precipitation impacts seasonally. Also the above hanged water may be fed by technogenic-originated wastewater from human activities. The water occurs at the 0.2-8.0 m level and due to the low infiltration coefficient of water bearing rock, the level gradually is becoming sustainable.

The water complex (IV) of neogene lake alluvium-proluvium sediment occur spottily in the North side of city center, in the area of 3 and 4th Micro district, in the North side of Sharkhad. Water bearing sediment is composed of clay and loam that is full of different type of fragmental material and gravel with yellowish and reddish color. The above-mentioned water bearing complex area is largely affected by construction activities and underground infrastructure that provides conditions for development of the pollution of underground water, water level raising phenomena.

The water complex of lower cretaceous lake sediment (K1) occurs in the northwest side of study area that is a narrow belt at the east side of the 21st micro district area. The water bearing sediment has sometime conglomerate narrow layer that contain different type of fragments of loam with green grey color.

The water horizon occur at 34-42 m deep with tens of meters thick at area where it is covered by quarterly regolith sediment, and its distinguished feature is that water is quite mineralized.

The water complex of Paleozoic sedimentary rock (C1) occurs along Tuul river valley in spotted form. The water bearing rock is a sandy rock with aleurolite, argillite and clay slate; it has layer structure with cracks. This water-bearing complex occurs in 34-70 m deep below surface, and sometimes at low relief areas it occurs as springs. According to some research materials, the discharge of those springs is 1.0-2.0 l/seconds.

The water complex of Jurassic intrusive rock (J) occurs in small area at the southeast of the study area. The springs of Hurkhee and Zalaat valley may have links with water bearing complexes of intrusive rocks with hole crack location.

According to the 1986 survey, the results of the chemical analysis of 284 samples from the water bearing horizon complexes were systemized and standardized according to the СНиП-II-28-73, and were detailed out according to the chemical components of corrosive characters of water concrete items. Thus, according to above-mentioned survey, it was identified that water with bicarbonate (HCO3) content occur in Ulaanbaatar city west side industrial complex; water with sulfate (SO4) content occur in Selbe river valley, Gandan area and area of 21st micro district; water with acid (pH) background indicator and unrestrained carbon dioxide content occur in suburban areas of the city.

Picture legend [Figure 40. Geological survey (drilling borehole) at the new Narangiin Enger Disposal Site]

6.8 Seasonal and Perennial Permafrost

Seasonal and perennial permafrost soil terrain and rock occur in Ulaanbaatar city. The permafrost of Mongolia is the southern boundary of the permafrost that covers northern part of the Earth, and comparing with the Siberian permafrost it has higher temperature and can be easily affected and changed by natural and human factors. Thus, the seasonal and perennial permafrost must be studied, and it is necessary to assess permafrost in advance to examine its impact and protect environment.

Soil terrain seasonal permafrost

In order to identify soil terrain' seasonal frost and thawing of Ulaanbaatar city area, field investigations and mathematic calculations have been applied in combination. The geomorphology, soil terrain temperature, sediment origin, lithology structure and physical composition have been taken into consideration to identify the deepness of soil terrain' seasonal frost and thawing and its occurrences.

Seasonal frost and thawing of alluvium proluvium sediment

The alluvium proluvium sediment of Tuul river and its basin valley is mainly composed of gravel compacted with sand and sandy loam. The soil terrain seasonal frost and thawing deepness is 2.7-3.4 m when the soil terrain temperature of Tuul river and its basin valley is from -0.5 degree to +1.5 degree, the moisture content is 5-15 percent, and volume weight is 150-1700 g/cm3.

According to the survey, the lowest level of the soil terrain's frost is at the swampy areas of river valleys.

Seasonal frost and thawing of deluvium-proluvium sediment

The Ulaanbaatar area is quite mountainous area. Deluvium, proluvium debris sand and sandy soil terrain occurs in mountain foot areas. Due to the relatively different distribution of the plant cover, moisture of soil terrain and sun' s warmth at mountain's north and south sides, the soil terrain of seasonal frost and thawing is different also. The seasonal thawing deepness of mountain's sunny side is 4.0-5.6 m when the temperature amplitude of ground surface of deluvium-proluvium sediment is 16-20℃, soil terrain's annual average temperature is 1-2℃, moisture content is 3-10 percent volume weight is 1100-1300 g/cm3.

The soil terrain frost and thawing of Tuul river valley and its basin, and mountain's north, south and sides belong to the continental and extra continental features.

Soil terrain seasonal frost and thawing, perennial permafrost evaluation

We have tried to run a simulation on how human activity affecting soil terrain's frost and thawing in Ulaanbaatar city area. In order to assess the soil terrain' frost and thawing, "Methodology of forecasting anthropogenic changes of frost conditions1" can be applied.

The deepness of seasonal frost and thawing of soil terrain under natural ground conditions has been measured by four main indicators (lithology structure, temperature, moisture, surface temperature amplitude).

In this section, we will forecast the changes of the frost and thawing deepness upon human activities by four parameters. For example: when the surface temperature amplitude of river valleys alluvium gravel, gravel sand soil terrain under natural conditions is 16-20℃, soil terrain annual average temperature is 0.5, +1.5℃, soil terrain moisture content is 5-15 percent, the soil terrain frost and thawing deepness will be 2.7-3.4 m. In case when river valley's plant will be extinguished and surface temperature amplitude will increase by 2-3℃ above natural conditions, the soil terrain annual average temperature will increase by 0.5-1.0℃, and soil terrain's seasonal thawing deepness will be 3.1-4.4 m (by calculations). In other words, there will be increase by 0.4 meters from the natural conditions, and perennial permafrost would start melting and thermokarst may cause depression, dips, and swamps.

6.9 Soil Coating

According to the soil geography regional division, the Ulaanbaatar city area located in Hangai soil-bio atmosphere, in Southern side of the Central Hentii circle of continental humid plateau region. Thus, there are 8 basic types of soil and their varieties occur in the area such as mountain turf-taiga soil, mountain forest dark and mountain black earth soil, black earth and meadow-black earth soil spread in valleys with and without stream water, meadow and meadow-swamp permafrost soil, and alluvium soil.

[1] *Translation from Russian*

Picture legend [Figure 41. The remaining of the formerly operating gravel-mining pit at Narangiin Enger]

The gravel to be formed in layers, gravel loam, sediment occur in the Ulaanbaatar city area, and the river water flow, underground soil terrain's water are playing important role in soil firmness. Depending on the processes such as river terrace, dry suspender, loop lake, high and low sandy and gravel dams, and depressions and dips between dams that have caused uneven surface soil occurrences along river's alluvial land the alluvium soil that occur in the area can be divided and characterized as alluvium turf soil, alluvium meadow soil, and alluvium meadow swampy soil. The alluvium turf soil occur in river's alluvial high land and at the terrace of alluvial land that have almost no influence of flood water, 30-40 percent of the area is covered by plantation mainly ueten and alag (impartial) grass with 10-15 cm thick well separated turf layer. The alluvium meadow soil occur low alluvial land, dry suspender, in depressions and dips between dams where it is flooded temporarily, and area's 70-80 percent covered with meadow plants mainly sedge, ueten and alag grass. Also in such soil, it is common to find asps, larches and bushes.

If you take the cross section of alluvium meadow soil, it is like alluvium turf soil that starts with turf layer well enmeshed root, and the layer is relatively thick with high content of humus elements. Also, spotted layers with ocher and bluish grey color occur frequently in the soil deepness with enough water and moisture environment.

However, the soil native feature is lost due to human settlement and industrial activities. The area is basically occupied with facilities and paved areas, and the earth soil of the study area is affected by human activities.

Ulaanbaatar city soil pollution

According to the chemical analysis, the Ulaanbaatar soil's pH is 7.7 or in other words it is loosely alkaline.

Table 34 Some soil elements' amount of Ulaanbaatar city

	pH	NO_3 mg/kg	SO_4 g/kg	P_2O_5 mg/kg
Ulaanbaatar	7.7	7.0	0.41	4.38

The amount of NO_3, SO_4 and P_2O_5 is shown in the Table 34. As the amount of sulfate and phosphorus in soil increased it means that soil pollution increased due to the human activities.

Soil heavy elements occurrences

As soil reaction environment becomes alkaline, the ionization of soil degradation element and negative charge of clay mineral increase, while positive charge of hydroxide and ferrous aluminum oxide decrease, thus, total soil negative charge increases. Heavy metal's general amount in Ulaanbaatar area is shown in following table.

Table 35 Some heavy elements in soil of Ulaanbaatar area (ppm)

		Pb	Mn	Sn	Ni	Cr	Mo	Cu	V
Ulaanbaatar	Minimam	4.3	308	7.2	2.6	2.5	2.1	4.6	5.7
	Maximam	50.0	1124	25.1	35.5	9.9	4.6	105.0	9.5

According to the survey conducted jointly by the Central Laboratory of the Ministry of Environment, Geoecology Institute and Moscow State University, as results shown in above

table, the heavy metals maximum amount in the soil is quite high in some areas of Ulaanbaatar city.

The earth soil pollution transfer and movement are relatively slow, and it is accumulated for many years.

Table 36 Soil Sanitary Analysis in the City Center of Ulaanbaatar

	Year	Nitrogen, mg/100g				Chlorine, mg/100g	Coliform	
		Total	NH_4	NO_2	NO_3	Cl	Amount	%
Actual Soil Quality Sampled in the Sewerage System Covered Area	1	112.0	0.4	-	1.1	9.2	$1x10^{-1}$	50
	2	126.0	0.4	0.04	1.3	12.8	$1x10^{-2}$	50
	3	90.0	1.5	0.06	1.7	10.1	$1x10^{-1}$	60
Target Soil Quality in the Sewerage System Covered Area	1	56.4	0.3	-	0.2	2.5	$1x10^{-1}$	50
	2	58.0	0.3	0.08	0.1	2.5	$1x10^{-2}$	50
	3	56.2	0.3	0.02	0.2	2.0	$1x10^{-1}$	60

The city center has a complete centralized sanitation (sewerage) system, and the results of the 3 years survey is shown in above table. The survey samples were taken from 0.25 cm thick soil and done by Medical University and Medical Institute.

According to the table, actual soil quality sampled in the sewerage system covered area is relatively higher than its target figures, however, it is lower than the area where there is no centralized sanitation system (the Ger area).

6.10 Flora

When the area had its own native features, it had been covered with various types of flora such as Stipa krylovii Roshev., Cleistogenes squarrosa (Trin) Keng., Agropyron cristatum (L.)Beauv., Carex duriuscula C.A.M., Allium bidentatum Fisch., Arenaria capillaris., Sibbaldianthe adpressa (Bge). Juz., Oxytropis kossinskyi B. Fedtsch et N. Basil.

Table 37 Flora species in the region where evaluation was conducted

No	Flora Latin name	Mongolia name
	Poaceae	
	Poa attenuata Trin	Tujuuny bieleg
	Festuca sibirica	Syberian botuuli
	Festuca lenensis Drob.	Leniin botuuli
	Koeleria cristata	Saman durvaa
	Helictotrichon schellianum	Sheliin butnuur
	Elymus sibiricus L.	Syberian ulungu
	Asteraceae	
	A. scoparia waldst.et Kit.	Yamaan wormwood
	A. Adamsii Bell.	Adams wormwood
	A. commutata Bess.	Hurgan wormwood
	A. sibirica	Syberian wormwood
	Iridaceae	
1.	Iris dichotoma Pall	Atsan ajigana
	Rosaceae	
1.	Potentilla anserina (L.)	Mulhuu gichgene
	Thymelaeaceae	
1.	Stellsria chamaejasme (L.)	Odoi dalan turuu
	Chenopodiaceae	
1.	Suaeda corniculata (C.a. Mey)	Evert budraga
2.	Chenopodium aristatum L.	Urgust luuli
3.	Salsola pestifera Hels.	Urgust budargana
	Plantaginaceae	
1.	Plantago major L.	Plantain
	Urticaceae	
1.	Urtica anquistifolia Fisch.ex Hornem	Narrow leave nettle
	Caryophyllaceae	
1.	Silene repens Patr.	Mulhuu sheergene
3.	Gypsophilla dahurica Turcz.	Daguuryn tair

Table 38 Ulaanbaatar area floral cover resources and capacity

	Floral characteristics	Area hectares	Percentage in total area	Yearly average crop growth rate centner/ha	Total crop yield tons	Pasture capacity to feed Nos. of sheeps
1	High mountain meadow	2,796.6	0.7	3.8	1,069.9	-
2	Forest	95,264.4	25.2	4.1	38,769.7	-
3	Mountain meadow	28,564.6	7.5	5.0	14,294.3	25,525.5
4	Mountain steppe	25,661.2	6.8	3.8	9,669.3	17,266.6
5	Lithophilic steppe	90,409.1	23.8	2.4	22,043.2	39,362.9
6	Steppe	93,818.9	24.7	2.1	19,809.8	35,374.6
7	River valley hygrophil meadow	29,490.1	7.8	4.2	12,348.4	22,050.7
8	Saline meadow Õóæèð ìàðaa?-solonchak	13,021.8	3.4	2.2	2,878.6	5,140.4
	TOTAL	379,026.8	100	3.2	120,883.2	144,720.7

The steppe characteristics are dominating in the floral cover, thus ecological capacity is not very high. 22.5% of the floral cover has less than 35% and 35.5% of floral cover has less than 50% range coverage. The floral density is low and the occupying area of a bare land is broad, thus the soil dryness is high and it's increasing the possibilities of depreciation by wind and water.

Biocapacity The herbaceous coverage biocapacity of Ulaanbaatar area varies widely depending on the floral species included in the group, ecological characteristics, usage characteristics, and overgrazed rate. For example mountain meadow bent grass containing type of biological crop reaches 11.8-16.9 centner/hectare, sedge-silverweed containing meadow crop reaches 31.2 centner/ha. River valley, flood-plain meadow crop was less than 10-11 centner/ha, less than a mountain meadow.

Agricultural crop, crop that can be eaten by livestock and animal reaches 2.1-17.3centner/ha in the mountain meadow and 0.5-7.1 centner (100kg)/ha in the steppe, and 3.2centner/ha from the total area.

Floral coverage capacity The land usage in the Ulaanbaatar area is difficult to be analyzed by season, it has settlement characteristics and the pasture border for four seasons is not clear. Only pasture with characteristics of herbaceous plant reach yearly crop yield of 81043.5 tons and converted to per sheep calculation it's capacity is to hold 144.7 thousand livestock.

The floral coverage original conditions is being lost and the valued species suitable for pasture is becoming rare and are being replaced by Adams and other weed that are not suitable for livestock and that demonstrate characteristics of an overgrazed soil.

Total of 51.7% of Ulaanbaatar floral coverage soil is overgrazed from which heavily overgrazed is 43.8 thousand ha, and medium overgrazed is 14.1 thousand ha.

Thus Ulaanbaatar city ecosystem is already damaged. The restoration process of Mongolian thin and sensitive soil coverage of mountains and hills are not easy, very costly, and require much capital.

6.11 Fauna

The original ecosystem was a natural landscape located between four mountains and due to the changes made to develop Ulaanbaatar city, like scraping the fertile layer of soil to establish factory area and long existence of the impact of man's operation, it eroded completely and changed into a man made soil, sand, and gravel. Additionally, following the development in the infrastructure department, especially growth of the businesses and apartment areas cause constant increase of the impact on the

surrounding environment. Thus the fauna and flora ecosystem characteristics of this region were lost and the fauna of the area is changed into a sinanthrop species that live in the settlement area beside humans.

In the central region of the Ulaanbaatar city the original fauna characteristics has been long lost and consists only from few types of mammals and birds.

We have determined common spread fauna species like 34 kinds of insects, 17 types of birds, and 4 types of mammals based on the short term evaluation conducted in Songino khairkhan district (1-2 km area including surface water dam, river, road, and huddled soil), residents' oral information, and limited printed information.

These findings don't have any rare species that are included in the Red Book of Mongolia (1987) and in the second attachment of the Washington convention (CITES).

From the bird species several types like P.domesticus and P.montanus sparrows, C.livia, Milvus migrans, Pica pica, Pyrrhcorax pyrrhocorax, Corvus corone, and Corvus corax were seen more commonly.

Table 39 Main fauna species Birds - AVES

	Shonhor helberten	Falconiformes
	Khartsgain ovog	Accipitridae
	Sokhor elee	Milvus migrans
	Shonhoriin ovog	Falconidae
	Idleg shonhor	Falco cherrug Gray
	Tagtaa helberten	Columbiformes
	Tagtaanii ovog	Columbidae
	Khadnii tagtaa	Columba rupestris Pall.
	Bor shuvuu helberten	Passeriformes
	Boljmoriin ovog	Alaudidae
	Shoroon alag boljmor	Eremophila alpestris L.
	Kharagchnii ovog	Motacillidae
	Kheeriin shiihnuuhei	Anthus richardii Vieill.
	Taliin shiihnuuhei	Anthus campestris (L.)
	Khereenii ovog	Corvidae
	Khon kheree	Corvus corax L.
	Khar kheree	Corvus corone
	Turliakh	Corvus frugilegus
	Alag shaazgai	Pici pica
	Jungaa	Pyrrhocorax pyrrhocorax
	Khuundein ovog	Turdidae
	Aduuch chogchoohoi	Oenanthe oenanthe L.
	Bujimch chogchoohoi	Oenanthe pleschanka (Lep.)
	Myaraan chogchoohoi	Oenanthe isabellina Temm
	Bor shuvuunii ovog	Passeridae (Ploceidae)
	Kheeriin bor shuvuu	Passer montanus L.
	Khadnii bor shuvuu	Perronia petronia L.
	Orongiin bor shuvuu	Passer domesticus




Photo 42. Corvus corax L., Passer montanus L., Pici pica, and Columba

From the mammal species souslik, Microtus gregalis, white mouse, and Mus musculus exist. From the insects there are mainly beetle species commonly met.

INSECTS

	Khatuu dalavchtan buyu tsokhiin bag	Coleoptera
	Jiigee tsokhiin ovog	Carabidae
		Taphoxenus laticollis Dej
		Taphoxenus dauricus Fish.
		Amara fodinoe Mannh.
		Harpalus amplicollis Men.
		Harpalus cervus Duft.
	Itsen sakhalt tsokhiin ovog	Scarabidae
		Gymnopleurus mopsus
		Scarbius sacer
	Aris ilegch tsokhiin ovog	Dermestidae
		Dermestes dimidiatus Stev.
		Dermestes sibiricus Er.
	Nyasluur tsokhiin ovog	Elateridae
		Selatosomus latis F.
	Mulgur tsokhiin ovog	Buprestidae
		Sphenoptera canaeiculata Pall.
	Bugalaa tsokhiin ovog	Meloidae
		Epicauta megacephala Gebl.
		Epicauta sibirica Pall.
		Mylabris frolovi Germ.
		Mylabris sibirica F.- W.
	Evert tsokhiin ovog	Gerambycidae
		Eodorcadion carinatus F.
		Eodorcadion humerale Gebl.
	Shuvgur tsokhiin ovog	Currculionidae
		Othiorrhynchus cribrosicollis Boh.
		Stephanocleonus oxicisus Rtt
	Khairsan dalavchtanii ovog	Lepidoptera
	Dengiin erveehein ovog	Pyralidae
		Prorophora albidogilvella Roester
		Staudingoria steppicola Curadja
	Sarisan dalavchtanii ovog	Hymenoptera
	Shorgooljiin ovog	Forimidae
		Tetramorium caespitum L
		Lasius alienus Forst.
		Cataglyphus aenescens Nyl.
	Khukhturuunii ovog	Tabonidae
		Haemotopoto turkestanica turkistanica
		Tabonus sobulctorum sobulctorum
	Ktiri yalaanii ovog	Asilidae
		Antiphrisson angustifrons Loew.

		Stenopagon maculilentus mongolicus Lehr.
	Dungenuur yalaanii ovog	Bombylidae
		Toxophora emeljanovi Zait.
	Sirfid yalaanii ovog	Syrphidae
		Paragus haemorrhaus Mg.

Chapter 7 . Negative Impact of the Project

The liable adverse impact by the Narangiin Enger Disposal Site and recycling complex on the environment is defined here, by the " Probability list matric method" . The basic assessment has been done before and ESCAP methods also have been used for these definition of liable adverse impacts.

Probability method is based on the principe of "Yes" and "No" , if there is impact, then it is noted by "õ".

Here, we have used 2 kinds of list. One of them shows impact form, time period, intensity and whether the impact is direct or indirect , and wthether clearing-up impact goes back or not, defining duplication , concerning duration whether it is long or short and how strong the intensity is.

7.1 Structure, Duration and Intensity of Possible Impacts on Environment.

Narangiin Enger Disposal Site: As shown in the table below the Narangiin Enger Disposal Site and Recycling Complex, judging from development plan, during the project activities, may give impact and affect on totally 24 items.

Direct impact (total affected items are 14) Most of the liable impacts comes directly. Concerned broken equipment, during the unexpected processing, contiminates water and it may be discharged , drained, infiltrated and give an impact on surrounding soil, contaminated plant having negative impacts to the pasture, micro climate changes , contamination of goundwater source .But there is some positive impact to the socio-economy by the result of activities of the Narangiin Enger Disposal Site and Recycling Complex. For example: That will be a new main central waste disposal site for the Ulaanbaatar helping for the poverty reduction and so on.

Indirect impact (1) - There will be indirect impact to the pasture surrounding the project implementer. Also indirect impact comes through the contamination substance because of not properly cleaning them to the underground substance ,water quality, plant and animals.

Short term impact (2) Narangiin Enger Waste Disposal Site and Recycling Complex make odour and fire during the strong wind, feeding of pest insect and during flood there is danger that contiminated water may be spread.

Long term impact (12) Most of the liable impact falls to the long term and contaminated water is discharged, drained, and infiltrated and will give a damage on surroundings and the soil there. Contiminatied liqiud may cause flora and plant changes and this may have a bad result. It will be a negative impacts source to the pasture, climate changes and underground water. Also negaive ipmacts come from the waste disposal site , which are bad smell, fire and breeding of pest insects.

Non-reversible impact (4) These impacts are air pollution , soil damage and impact on workers' health. Contaminated water infiltrates to the soil and groundwater. These are kinds of negative sides.

Strong impact (12) This kind of negative side covers comparatively more part of the negative impacts. That is contaminated water discharged, drained, and infiltrated may give a damage on surroundings and the soil. Contamination makes changes in flora and plant and these have negative results and come as a source of negative impacts to the pasture, climate changes , underground water and air pollution. These impacts also have negative impacts to the workers' health.

Middle level impact (5) Negative impacts will cause microclimate changes, a deterioration in pasture and change of the quality of underground water. Because of not having clean, uncontaminated water it damages plant and animals. Also because of infiltered water, soil and underground water will become contaminated resulting in unpleasent/ offensive odours and a breeding of the insect population/pest.

Table 40 List of the negative impact to the environment

Environmental impact	Direct	Indirect	Recovered by itself	Short term	Long term	Reacting impact	Non reacting impact	Strong	Medium	Small
1. Changes in Biodiversity										
Change of surface drainage										
Changes of the underground water drainage	x				x			x		
Changes of the Plant structure	x				x			x		
Soil erosion and damage	x				x			x		
Changes to areas for Animals	x				x			x		
Changes (micro) in Climate	x				x			x		
2. Nature resource and usage										
Pasture condition		x	x						x	
Power resource		x			x			x		
3. Nature and environmental changes										
Underground water quality changes		x			x				x	
Surface water quality changes										
Air pollution	x				x		x	x		
Soil contamination	x				x		x	x		
4. Beauty of nature, historic& cultural memories, archaeological, paleontological findings										
Changing of the natural beauty										
Change in landscape, shape & colour	x				x				x	
Impact to the specially protected areas										
Impact on the historic & cultural memorials										
Impact on the archaeological & palenteolocal remains										
5. Socio-economic issues										
Increase of the local income	x				x		x	x		
Support for poverty reduction	x			x					x	
In increase in job and position	x								x	
6. Other impacts										
Contamination of ground water through soil and surface by contaminated water	x						x	x		
Offensive odors from waste disposal site and pest reproduction/ breeding in insects	x				x			x		
Fire from the waste disposal site	x			x				x		
Total	14	3	1	2	12	0	4	12	5	0

7.2 Possible Impacts by Project Implementation regarding the Location of the Project Site

For the impact calculation on the basis of the experts analysis, we used the list of probability method.

Project location impact - The most important issue should be protection of an environment and population health around Narangiin Enger waste disposal site and the recycling complex. Project activities should be directed to these issues.

Table 41 List of the possible impact concerning project implementation, location, decision and planning

Environmental issue	No impact	Consequences		
		Small	Middle	More
1. Environmental challenges related to the project location				
Change of river direction, and erosion of banks that leads to flood	x			
Needs assessment of population resettlement concerning project location		x		
Cut and damage of forests	x			
Damage of historic and cultural places,archaelological and palentological findings	x			
Conflict between the organizations of water supply & usage	x			
Change in water(river) conditions, draining and drying out	x			
Contradiction with other facilities such as railroad	x			
2. Environmental issue concerning project decision and planning				
Whether operation and land use fit or not to the local area; whether the chosen tools and machinery match the operational works of the disposal site, sorting yard and monitoring of the local sanitary				x
How well the workers' security for work-related injuries and diseases and protection from poisonous gas and fire, etc. are planned			x	
Pollution caused by technological operation to the water, air and soil, and generation of too much noise or waste			x	
Whether poisonous gas, dust or fume etc is generated., that needs special attention			x	
3. Environmental issue during the project implementation				
Whether the plans for project operation and afterwards actions are well formulated and how financing plans are reasonable and realistic			x	
Plans for work-related injuries and disease, and work security is well planned or not, whether the financing is well planned			x	
How well the soil restoration works (planting, vegetation, grass, irrigation) and environmental beautification works are planned			x	
Whether the plans for urgent monitoring, its period and financial issues are planned well		x		
Issues concerning engineering and financial possibilities			x	
4. Criteria of project review assessment (policy issue)				
Project result affecting negatively or dangerously to biological species		x		

7.3 Possible Impacts related to Technical Operation of the Project

Here we used Leopold matrices method, while taking into consideration technological phases to the environmental impact. This method needs to do below-mentioned operations:

- If there is any impact, the box will be divided into 2 pieces by slanting line.
- Below the divided sections, possible impacts are evaluated by scores from 1 to up to 10 according to the importance.
- Above the divided sections, the impact is evaluated how it is stronger or not scored by 1-10 points again. Here if there is score 1, it means the impact is not stronger, and score 10 means there is a strong impact.

Table 42 Impact to the Environment by technical Operation at Narangiin Enger Waste Disposal Site and Recycling Complex

	Operation	Air quality	Groundwater	Soil	Plant (pasture)	Animal, microorganism	Human health	Total
Constant Σ1	Unloading	9/7		9/7	9/7	8/6	8/7	**43/34**
	Pushing	9/7		10/8	9/7	8/5	9/7	**45/34**
	Soil covering	9/7	5/5	8/7	8/6	7/5	9/7	**46/37**
	Removal of landfill gas from waste	7/6			3/2	3/2	5/4	**18/14**
	Treatment of leachate		7/6	7/5		8/5	5/4	**25/20**
	Sorting of recyclable waste	9/7					9/7	**18/14**
	Washing and cleaning of recyclable waste	9/7					9/7	**18/14**
	Burning of waste	9/7					9/7	**18/14**
	Cooling down cut RDF	9/7					9/7	**18/14**
Occassional Σ2	Increase of insect / pest	7/7	7/4	7/5	6/3	6/3	7/7	**40/29**
	Too much gas generation and fire caused by it	8/7		7/5	7/5	7/5	8/7	**37/27**
	Leachate leakage due to facility breakdown	7/5	9/8	9/9	7/6	7/6	7/6	**46/40**
	Waste and leachate leakage due to natural disaster (earthquake, flood)	8/7	7/5	8/7	8/7	7/6	8/7	**54/46**
Total	Constant Σ1	**70/55**	**12/11**	**34/27**	**29/22**	**34/23**	**72/57**	
	Occassional Σ2	**30/26**	**23/17**	**31/26**	**28/21**	**27/20**	**30/27**	

Looking at this table assumption of the vertical column shows unloading waste to the site/43/34/.

The survey result of this table shows us that during the possible sudden accident of the common operations impact could be 2 times bigger. So, here it is necessary that technological procedure should be kept during the working operation to be vigilant and alerted to mitigate the possible impacts. So, we took into consideration at the main evaluation above –mentioned permanent and temporary impacts.

The purpose was to plan for the mitigation and elimination measures of the main possible impacts to the environment and discover them during the project implementation of Narangiin Enger Waste Disposal Site and Recycling Complex. For the environmental baseline survey, analysis for the project activities, predefinition of possible impacts, some impacts measurements which have done by specialists/experts where in some cases they have been directly participating , here we used Battell system methodology for the comprehensive/ integrated evaluation of all experts analysis and conclusions. This method is used for the cumulative result of all environmental changes and evolution getting in one system of all experts' evaluation and analysis. Other way, the changes/ Environmental Impact Units are calculated in the cases of " before project" and " after project period " and difference between the periods is calculated.

7.4 Project Main Impacts

Battelle system method

Battelle system method is widely described in UN's Asia Pacific social and economic committee instructions for 1992.

The main characteristic of the method is to give impact evaluation as objectively as possible, invert them into numerical meaning and sustaining environmental impact units condition for all the ecosystem parts' surrounding factors. This method was initially formulated in the Battelle laboratory of USA Irrigation Bureau. To do evaluation by this method needs following requirements:

- Collect correlated data between numerical value of environmental impact assessment and its quality evaluation (small, medium, and big strength).
- Draw a graph using collected data for every environmental impact. To do this the environmental evaluation level should be divided into equal parts from 0 to 1, and plot the values as correctly as possible for every section and draw the graph. The horizontal line should show the evaluation level from 0 to 1, 0 being the biggest impact and 1 being no impact level.

If the graphs drawn by the assessors are very different from each other the evaluation should be re-checked and done again. Using this evaluation graph every impact of the project should be shown in numerical value for before and during the project period. Use these numerical values to invert project's environmental change system impacts' total value into unified evaluation. For example, this total value should be compared to value of 1000 to determine relative meaning for every environmental change.

In this report, environmental change system assessment for the projects "Narangiin Enger disposal site" and "Waste recycling plant" was determined by value of 40 and inverted into relative unified meaning; and this was used to determine the relative mass in the following manner:

Natural condition	197.10
Natural resources and use	135.05
Earth, soil	167.90
Still water	131.40
Well and groundwater	62.05
Air	47.45
Health	69.35
Society and economy	109.50
Historical valuable, resort	116.80
Total	1,036.60

Using the relative mass and the following formula, the amount for possible impacts for before and after project period can be determined:

$$E_1 = \sum_{i=1}^{m} \left(V i_1\right) W_i - \sum_{i=1}^{m} \left(V_{i_2}\right) W_i$$

That: E_1 - environmental impact difference before and after project

$\left(V_{i_1}\right)$ - Environmental quality indicators in the period of before project

$\left(V_{i_2}\right)$ - Environmental quality indicators during the project implementation

W_i - Relative weigh,

m - Number of indicators`

Those two indicators are described such as (+) plus, (-) minus signs and (-) means negative impact.

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Table 43 Possible impact assessment calculated by method of Environmental evaluation system

			During the project implemenattion	Pre-period of the project	Difference
Ecology	Natural condition	Geological formation	32.85	10.95	-21.90
		Water ðÍ	32.85	25.55	-7.30
		Fauna	32.85	25.55	-7.30
		Flora	32.85	21.90	-10.95
		Endangered animal	32.85	32.85	0.00
		Endangered Flora	32.85	32.85	0.00
	Natural resources usage	Natural mineral resources	32.85	3.65	-29.20
		Pasture	32.85	21.90	-10.95
		Water resource	32.85	25.55	-7.30
		Forest resource	32.85	32.85	0.00
		Power resource	3.65	3.65	0.00
Öyshical-chemical changes	Earth , soil	Break soil deposit	32.85	3.65	-29.20
		Soil degradation	32.85	3.65	-29.20
		Soil fertility	18.25	3.65	-14.60
		Soil pollution	32.85	25.55	-7.30
		Earthquake	32.85	18.25	-14.60
		Fire	18.25	18.25	0.00
	Surface water	Water direction change	32.85	32.85	0.00
		Water turbidity	32.85	25.55	-7.30
		Amount of oxygen in the water	32.85	32.85	0.00
		Water pollution	32.85	25.55	-7.30
	Groundwater	Water infiltration loss	29.20	29.20	0.00
		Groundwater pollution	32.85	32.85	0.00
	Àir	Climate change	21.90	14.60	-7.30
		Àir quality	25.55	3.65	-21.90
Socio-economy	Health	Public health	10.95	25.55	14.60
		Communicable disease	29.20	29.20	0.00
		Work related disease	29.20	29.20	0.00
		Food supply	0.00	0.00	0.00
	Socio-economy	Water supply	18.25	10.95	-7.30
		Energy supply	7.30	7.30	0.00
		Road, communication	14.60	25.55	10.95
		Flood monitoring	14.60	25.55	10.95
		Ressetlement	32.85	32.85	0.00
		Increase of jom placement	7.30	21.90	14.60
		Poverty reduction	14.60	25.55	10.95
	Historic memorable places and Resort area resresoarea	Historic memorials	29.20	29.20	0.00
		Àrchaeologically valueble area	32.85	32.85	0.00
		Beauty of nature	25.55	10.95	-14.60
		Tourism and resort condition	29.20	29.20	0.00

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Table 44 Project pre-period and during the project implementation's environmental condition assessment total indicators and differences calculated by method of Environmental evaluation system

	Ecological and economical part of components	During the project implementation	Pre-period of project implementation	Difference
Ecology	Natural condition	197.10	149.65	-47.45
	Natural resources and use	135.05	87.60	-47.45
Physical & Chemical changes	Earth, soil	167.90	73.00	-94.90
	Surface	131.40	116.80	-14.60
	Groundwater	62.05	62.05	0.00
	Àir	47.45	18.25	-29.20
Socio-economy	Health	69.35	83.95	14.60
	Socio-economy	109.50	149.65	40.15
	Historic, tourist and rest places	116.80	102.20	-14.60

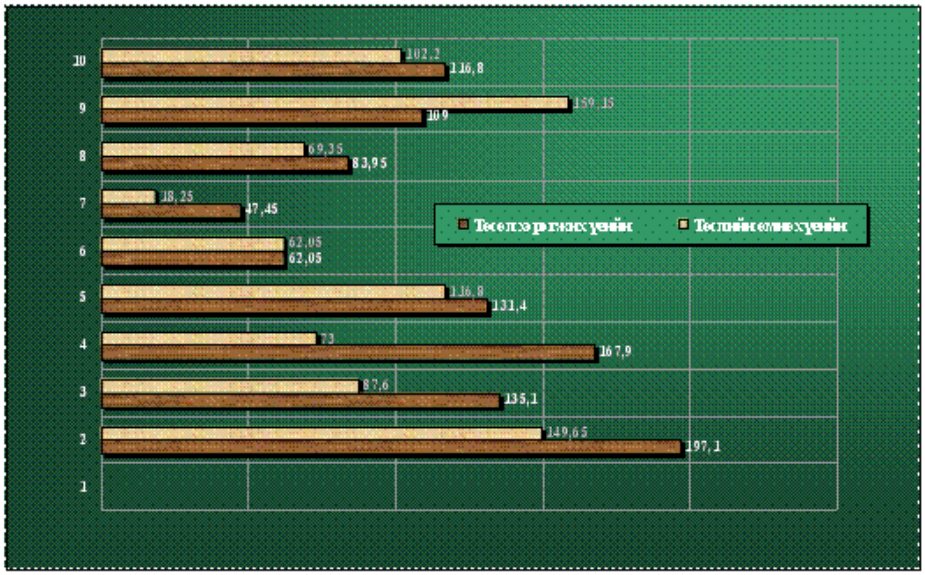

Figure 43. Environmental condition assessment indicators pre-period of the project and during the project implementation

1-Nature condition, 2-Nature reserve, 3-Earth, soil, 4-Surface, 5-Groundwater, 6-Air, 7-Health, 8-Socio-economic situation2, 9-Historical, tourist and rest places

Table 43 shows differences for before and during the project period for every 40 indicators included in the survey and the negative value shows the negative impact with big value meaning big impacts.

Looking at the above table we can say that the differences for before and during the project is greatly negative for areas like natural resources, soil deposit, soil, and air and it is apparent that actions should be taken to eliminate or decrease these main impacts. Simultaneously, we can see that the project will bring more job opportunities to the local area and the poverty will be reduced.

Ecological, physical and chemical changes and unified economic-ecological evaluation for the society and economics are shown in table 44 and Figure 43. Figure 43 shows that the impact on natural condition (geological formation), natural resources, and soil is the greatest.

The environmental protection plan should be drafted according this impact assessment and the difference for before and during the project period should be attempted to reduce.

Figure 44. Illegal burning of asphalted paper to draw out bitumen in future Narangiin Enger disposal site area.

Chapter 8. Recommendation for Mitigation and Elimination of the Negative Impacts on Environment

Specialized experts who were related to the environmental impact assessment of the project are proposing the following measures based on the results from the basic environmental survey of the Narangiin Enger Disposal Site (NEDS) and Recycling Complex (NERC) and assessment of possible impacts from the project's operations and implementation:

- Use this proposition, "Plan for Environmental Protection", and "Environmental Monitoring Plans" as a fundamental aid to keep the impacts on the environment at minimal level and organize yearly works to protect the environment.
- Calculate costs for all the measurements written in documents and include in yearly financial plans and budget.
- In case of the operational change of the project, ask Agrar company (the consultant employed by MUB, the proponent of the project) to modify the environmental impact assessment
- Give information and study materials to all of the staff about laws and regulations for protecting the environment and monitor implementing of the knowledge in real life.
- It is better to take measures to decrease or eliminate negative impacts on the environment in the direction mentioned below.
- Looking at the impact on local air, water, soil, flora, and human health during operation, the main impact is caused by the possible leachate and the sludge from leachate treatment facility

1. Air

- In case of earth work such as repairing or changing of gas removal pipes, it is better to consider a climate conditions to eliminate dust and dirt volume in the area. For

example soil covering works: waste unloading, pushing, and compacting can be done during the morning and evening times when there is less wind and the soil has some moisture in it so that the technological works would generate less litter.

- Install catalytic and thermal radiator to decrease poisonous gas emitted from the exhausting pipes of the vehicles working at the site. Use vehicles with as less noise as possible.

2. Water

- Prevent accidents by regularly checking leachate collection pipes and pipe foundation and eventually protect the environment and decrease accidents' number.
- Use monitoring well and install automatic recorder to record and regularly monitor water level.
- To prevent leachate from penetrating into the soil and polluting the groundwater, and every year check with hydraulic pressure to monitor whether there is any infiltration.

3. Soil and Flora

- Access road and on-site road should be paved.
- In case of a contamination of a well or drainage soil, conduct an examination and disinfect to prevent any disease and insects from spreading.
- Prevent leachate penetration
- Dispose of waste at the area isolated from the outside.
- Release the poisonous gas as soon as possible
- Discharge the leachate as little as possible.

4. Public health

Strictly require workers to follow the technical safety regulations and take safety measures in accordance with the law. These include:

- Require workers to wear work uniforms and protection devices regularly and provide trainings about this issue.
- Constantly give cautions to people who work with the electricity and machines.
- Regularly conduct three level safety examinations and eliminate promptly any violations.
- Take necessary measures to prevent a fire.
- Every year examine the workers' health with the help of professional medical staff and take actions to cure and prevent their diseases.
- Implement first aid measures.
- Regularly conduct a disinfection following the specific instructions on the machineries that work with the wastes due to the easily accumulated bacteria.

Chapter 9. Additional Chapter concerning Technical Matters

With reference to the Master plan on the improvement of the Ulaanbaatar city Solid Waste Management the EIA on "NEDS and Recycle Complex Development" was drafted based on environment related official Mongolian laws, regulations and standards, and the development projects have to follow below-mentioned laws, regulations, standards and other relevant legal provisions on environment.

9.1 The project related Mongolian laws and regulations

1. Environmental Protection Law of Mongolia
2. Law on Environmental Impact Assessment
3. Law on Household and Industrial Waste
4. Law of Mongolia on Land
5. Law of Mongolia on Water
6. Law of Mongolia on Air
7. Law on Meteorology and Environment Monitoring
8. Water Program (Government Resolution 43, 10 March 1999)
9. Environment Standards
    1. Air Quality Indicators
    2. Urban area's Soil Sanitation Assessment Indicators
    3. Drinking Water Standards, UST 900-92
    4. Urban area's Soil Sanitation Assessment Indicators Standard
        MNS 3297:91
    5. Rehabilitation of degraded land, Technical Requirement
        MNS-4916: 2000
    6. Plantation of degraded land, Technical requirement MNS 4918: 2000
10. Regulation on Discharge of Household Waste Water and Toilet Hole Internal Lining (Appendix to the Joint Order of Minister of Environment and Health, No.169/171, 1995)
11. Government Regulation on Measures to improve Waste Management (No.256, 3 November 2001)
12. Operational Plan to Dispose Waste in Environmentally Sound Manner (Appendix to the Government Regulation No.256, 2001)
13. List of Mongolian standards related to environment health

9.2 Environment issues to be considered during project implementation

DIRTY WATER SYSTEM

No	Impact	Mitigation measure
	Direct impact	
1	Degradation to animal and plant reproduction and protection areas due to facility construction activities	Monitor degradation during facility construction
2	Change in hydrographic balance of watershed when dirty water carried from up stream to down stream	-Consider sector regional and small settlement system in areas with water shortage -Particularly, utilize all available methods to recycle and rehabilitate dirty water in areas with water shortage
3	Environment water quality decrease due to overflow, flow around and breakdown of sewage water treatment system	-Take necessary measures to collect and treat dirty water in order to prevent from direct untreated discharge -Select the most suitable technology -Make a design that allows easy repair and maintenance, and ensure reliability -Provide with manual on management, training recommendations, monitoring plans and how to treat industrial dirty water (from recycling complex)
4	Site area contamination: -Soil and plant by poisonous substances and pathogen -Underground water by poisonous substances and nitrogen	-Establish a system to treat, discharge or re-use dirty water based on sufficient information about dirty water indicators and land use -Provide with manual on monitoring and recycling of industrial dirty water - Verify instructions on pre-treatment and operation of land use and dirty water recycling system
5	Odor and noise generated by treatment process and discharge of sludge	-Select advanced technology -Consider an applying equipment to control odor and with less noise during design process -Provide with recommendations on management and training -
6	Contamination of landfill soil, plant and ground water, and breeding and feeding of diseases spreading organisms	-Coordinate every phase such as to make a feasibility study, select appropriate technology and design a management system of dirty water treatment; to select labor; to conduct a training; and to make plan and start to implement it; and etc. -Introduce advanced methodology to treat dirty water -Check whether operation is done according to instructions
7	Accidents to staff that may caused by gas or poisonous materials accumulated in leachate treatment facilities' pipes and other closed parts	-Conduct special safety related trainings and other educational works for staff -Provide with reliable equipment and monitoring tools -Follow safety regulations of industrial process
8	Serious hazard to public and staff health caused by chlorine accidents	-Provide with reliable planning, operation regulations and training -Prepare plans to combat accidents
9	Improve population health in areas where accident happened	-Introduce manuals on health preventive treatment and health education
10	Re-settle residents from landfill area	Provide assistance to re-settlers

11	Negative impact on scenery and social order in surrounding area of disposal site and recycling complex	Consider measures that are in interest of public and environment improvement in re-settlement projects
	Indirect impact	
12	Unplanned infrastructure excessive development	-Install infrastructure of disposal site and recycling complex according to land use -Improve land use monitoring and coordination -Coordinate infrastructure planning with city development plan

SOLID WASTE COLLECTION AND DISPOSAL SYSTEM

No	Impact	Mitigation measure
	Direct impact	
1	Clogging of flood water channel filters due to waste	Establish a full-fledged waste collection system in residential areas
2	Scenery worsening due to waste heaps	Establish a full-fledged waste collection system in residential areas
3	Increase in disease spreading insects due to open waste discharge	Establish a full-fledged waste collection system in residential areas
4	Waste scattering out of waste containers due to break of waste bags, and later being more scattered because of animals	Educate residents to discharge waste just before waste collection schedule
5	Collection worker injuries due to waste container over discharge (such as injury to human body back)	-Keep waste container average capacity 80-100 liters -Use completely enclosed type of truck or cover waste with cloth
6	Waste scattering and dust generation along waste transportation route	Use completely enclosed or cloth covered trucks
7	Injuries caused to workers due to non-transportation of hazardous waste separately	-Study and monitor industrial hazardous waste amount and their degree of hazardousness -Dispose using special system and special transportation -Check accurately before discharge
8	Dust generation during loading and unloading	Use enclosed containers in loading and unloading areas and apply air filter, and introduce ventilation
9	Loss occurred to collector and recycler due to interruption of secondary raw material processing	-Design and develop non-stop collection and transfer system of secondary raw material (recyclables) -Separate secondary raw material from waste before discharge -Train unemployed people and waste pickers and provide them with labor allowances
10	Odor generation from disposal site and recycling complex	Level disposed waste and cover with soil daily, install gas removal coordination system
11	Odor generation from compost system	Improve ventilation during composting
12	Underground water pollution due to penetration of from waste	-Make a non penetration linear underneath of waste disposing area -Make the lowest part of waste disposing area at the appropriate level considering the underground water level -Establish a disposal site at a certain distance from open water
13	Pollution of water reserves due to penetration	-Re-locate waste disposal site and recycling complex if penetration does not decrease
14	Extinction of plant and trees with deep root due to gases generated from waste and accumulated underground	-Install gas removal facilities at a disposal site
15	Generation of toxic gases from waste	-Install gas removal facilities at a disposal site -Do not construct any building nearby disposal site -Install monitoring wells nearby disposal site
16	Decrease in air quality in nearby area of disposal site and recycling complex	State monitoring of air quality
17	Soil contamination and biological changes due to use in compost of chemical toxic elements (heavy metals etc)	-Determine chemical substance concentration and estimate compost amount for a certain harvest area -Set limits for substance usage -Estimate compost amount in planting based on compost concentration structure -Estimate compost amount based on above estimations
	Indirect impact	
18	City budget burden due to inappropriate waste collection equipment and inefficient system	-Examine collection equipment before practical use -Estimate costs based on cost comparison of applying different types of equipment in different circumstances -Improve service and reduce costs -Select the most economically suitable route for waste collection -Establish transfer station if direct transportation is economically not feasible (transportation time takes more than 1.5 hours and more than 15 km) -Conduct survey and monitoring among waste collection workers to improve work efficiency -Reduce idle working hours by making appropriate equipment spare parts orders
19	Increase in energy consumption due to inefficient operation of new disposal site and recycling complex	-Provide with appropriate equipment recycling, sorting and collection operations -Establish well organized transfer system based on separation of recyclables from general waste

ENVIRONMENTAL PROTECTION PLAN OF "NARANGIIN ENGER DISPOSAL SITE AND RECYCLING COMPLEX" PROJECT

Project Implementing Agency "UB Mayer's Office"

A. Measures related to the Technology

1. Air Pollution - Code- J_0

1.1. Brief Definition of Impact

The concentration of the toxic gases like NH_3, SO_x, NO_x, CH and etc. may increase, discharged into air during landfilling at the Narangiin Enger waste disposal site.

1.2. Affected Area

Human being, animals, livestock and air surrounded

1.3. Allocated Level by Standard

The resolution on the " The maximum allocated size and standard of toxicos in an air". (Approved by State Hygiene General Inspector , #11, 1989 year Appendix2)

- Size of the allocation by certificate
- Environmental allocation certificate rule/act is not approved yet. (for the meanwhile)

1.4. Measures to be taken for Impact Mitigation, Elimination and Environmental Rehabilitation

	Activities to be executed	Period	Total expenses (in Thousand MNT)	Responsible party
1.	To monitor continuously gas removal facility	2008 - 2013	100.0	UB Mayor's Office, Nuuts Co.
2.	To conduct air pollution examination inside and outside the disposal site once a season	2008 - 2013	300.0	UB Mayor's Office, Nuuts Co.

1.5. Requirement for the Observation

Required to make review of the measurement and to find out air pollution every year.

1.6. Source of Financing

The expenditure of environmental protection plan will be planned and spent in a budget of finance yearly.

2. Soil Contamination-Code-S_0

2.1. Brief Definition of Impact.

The contamination of the soil could be triggered by leachate leaking into soil. The source of the contamination is in filtering into soil through the landfill by rainfall.

2.2. Affections

Human being , animals, fauna, plants and environment.

2.3. Allocated Level by Standards

Minister's resolution # 68/A/61, June 22, 1989, Appendix 5, Ministry of Nature and Environment and Ministry of Health. (UST 3297-91). Soil hygiene assessment indicators and standards of the cities and settlement areas.

2. 4. Measures for Impact Mitigation, Elimination and Environment Rehabilitation

1	Activities	Period	Total expenses (Thousand MNT)	Responsible party
1	Plant trees around disposal site	Starting from 2008	1,000.0	Mayer's Office and Waste Disposal Site/Landfill Administration
2	Frequent monitoring of leachate treatment facility	Every year	150.0	Mayer's Office and Waste Disposal Site/Landfill Administration
3	To conduct soil examination once a season in and around the disposal site	2008-2013 years	300.0	Mayer's Office and Waste Disposal Site/Landfill Administration

2.5. Requirement of the Observation Monitoring

Quality warranty should be provided once in two years. Registration of land usage/landfill will be provided and reported to the related agencies on time.

3. Water Contamination-Code -W0

3.1. Brief Definition of Impact

The source of contamination, during the possible accident could go through the soil and pollute groundwater.

3.2. Impact Affected

Negative impact is possible to expand strongly on groundwater, surface, plant and environment due to pollution.

3.3. Allocated Level by Standard

See the Drinking water quality standard UST0900-92, Surface and groundwater, clean water classification.

3.4. Measures in the Direction of Impact mitigation, Elimination and Environment Rehabilitation

1	Activities	Period	Total expenses (Thousand MNT)	Responsible person
1.	Clean leachate treatment system	Starting from 2008	1,000.0	Mayor's office and Waste Disposal Site Administration
2.	In order to determine whether leachate is infiltrating into the soil, to take water samples from a bore hole at the down stream of the disposal site	2005-2008	1,000.0	Mayor's office and Waste Disposal Site Administration
3.	To take samples from the monitoring well and examine once a season	2008- 2013	300.0	Mayor's office and Waste Disposal Site Administration
4.	In case of leachate infilitaration into the underground water, remove broken liner and use, if required, in short period of time a demulgator (toxic element neutralizer) that is to be prepared in advance.	2008- 2013	1,000.0	Mayor's office and Waste Disposal Site Administration

3.5. Requirement of the Observation

Required to monitor quality of surface and underground water.

3.6. Source of Financing

Additional expenses for the renovation of the technology will be calculated in investment. In financing plan, the environment protection expenditure is planned every year.

B. Environmental Management and Organization

1	Activities	Period	Total expenses (Thousand MNT)	Responsible person
1.	To input environmental management and organizational methods into the operations and build rules and organizational regulations relating this	Every year starting from 2008	200.0	UBC Mayer's Office, waste disposal site administration
2.	To give a responsibility of environmental issues to a staff at managerial position	2008 start year	By internal allocation	UBC Mayer's Office, waste disposal site administration
3.	To organize a training related to protecting environment and do it 1-2 times a year	2007-2008 year	500.0	UBC Mayer's Office, waste disposal site administration
4.	To complete and send yearly report on environmental issues on time	Every year starting from 2008	200.0	UBC Mayer's Office, waste disposal site administration
5.	To work together with local health organizations during occurrences of possible accidents, to make agreements in advance with these organizations, to exchange information on specific technology related professional disease, accidents and poisoning, and to take relevant measures to be prepared for accidents	Every year starting 2008	500.0	UBC Mayer's Office, waste disposal site administration

6,550,000 (Six million five hundrid fifty thousand) MNT will be spent to environmental protection and for impact reduction activities

Programme developed by : "AGRAR" Co. Ltd.

ENVIRONMENT MONITORING PLAN FOR "NARANGIIN ENGER DISPOSAL SITE AND RECYCLING COMPLEX" PROJECT

Implementing agency "UB City Mayor's Office"/ Municipality

During the project implementation the monitoring should be done on the operations according to conclusion coming from the assessment and recommendation, and also environmental plan and programme should be developed. For these purposes, activities mentioned below will be provided as follows :

1. Air pollution - Code-J_0

1.1. Monitoring Control Analysis Indicator:
Air content of NH_3, CO_x, CH_4, SO_x and so on

1.2. Type of the Monitoring Control
Sample analysis

1.3. Location
Waste disposal site

1.4. Period of Monitoring Control and Schedule
To agree detailed period of monitoring, control and its schedule with professional agencies

1.5. Methodology

UST17.2.3.16-80 " Monitoring/control act of air quality in the cities" UST3384-82", "General requirement of the Biosphere sampling"

1.6. Equipment:

Not necessary

1.7. Registration and Report

The report will be written according to the application form (registration) issued by authorized organization.

1.8. Data Collection, Processing and Report :

Monitoring/control results will be sent to the local government within first 10 days of next quarter period.

2. Soil pollution - Code-S_0

2.1. Indicator to Conduct Monitoring

Issue annual report on soil chemical contamination, land in use and its ptotection..

2.2. Type and Form of the Monitoring and Analysis

In fixed and approved period, land utilization registration and report will be done by measurement in every year .

2.3. Location

From waste disposal site.

2.4 Period of Analysis

Coordination should be done with the timing of the land condition and quality control monitoring period. Land use operation report and registration should be done by 15 November every year.

2.5. Methodology

To define the content of the pollution of heavy and poisoning elements comparing before-project and after-project situation, taking samples and examining by professional agencies from fixed critical control points.

2.6. Equipment:

Not necessary

2.7. Registration and Report

The report will be written according to the application form (registration) issued by authorized organization.

2.8. Data Collection, Processing and Report

Each time the report will be sent to the local government agencies.

3. Groundwater pollution -Code-J_1

3.1. Monitoring Control Indicators

The indicator of bacteriology, nitrogen and other compounds

3.2. Types of Monitoring Control
Ground water bacteriology and chemical decompose analysis

3.3. Location
From control well.

3.4. Monitoring Period
Once in quarter period.

3.5. Methodology
"UST3534-83" Sampling method of water analysis, chemical analysis of standard and reconciling/harmonizing

3.6. Equipment
To be equipped making control bore-hole. Wells should be done at the end of the groundwater streamline/drainage of the waste disposal site.

3.7. Registration and Report
The report will be written according to the application form (registration) issued and approved by authorized organization.

3.8. Data Collection, Processing and Report
Each time the report will be sent to the local government agencies.

Programme developed by : AGRAR Co. Ltd.

8.2 Public Hearing

8.2.1 First Public Hearing

a. Background and Objectives

a.1 Background

The Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia (hereinafter called the JICA SWM Study) is being conducted from November 2004. The Study consists of the two Phases and the Phase 1 of the Study, Formulation of the Master Plan (M/P), has been completed. Based on the M/P, the following projects are identified as priority projects for the feasibility study, which examines the viability of the projects:

- Development of a new Narangiin Enger Disposal Site (NEDS); and
- Development of a recycling complex next to the NEDS.

In Municipality of Ulaanbaatar (MUB), there are three official final disposal sites which are Ulaan Chuluut, Morin Davaa and Nalaikh Disposal Sites. Among the three official final disposal sites, Ulaan Chuluut Disposal Site (UCDS) is the biggest one receiving more than 90 % of the wastes generated in the City. The remaining service life of the UCDS is only few years and a residential area is approaching less than 800 m away from the site due to rapid expansion of the Ger Area. Therefore, a new disposal site for central 6 districts needs to be constructed as soon as possible and the existing site must be closed. Through the transparent selection process the Narangiin Enger was decided as the proposed future disposal site for the central 6 districts in MUB officially at the the Steering Committee (St/C) meeting of the JICA SWM Study on April 20th 2005. In response to the decision, development of the new

NEDS is proposed to replace the UCDS and is subject to the feasibility study and environmental impact (EIA) study.

In the M/P, the JICA SWM Study concluded that recycling activities shall be conducted by the private sector in principle and that the role of public sector (MUB) shall be limited to promote, support and regulate the recycling activities of private sector and to develop technologies to recycle the wastes that the private sector can not deal with. As for the development technologies to recycle the wastes that the private sector can not deal with, the JICA SWM Study concludes through the examination work that

1. Construction of a refuse derived fuel (RDF) production facility to introduce RDF technology because it contributes to develop technologies to recycle the wastes that the private sector can not deal with and to mitigate problems for the sanitary landfill operation; i.e. scattering wastes and spoiling stability of landfill.
2. Provision of a manual sorting facility to treat wastes coming to the RDF facility (separate recyclables and unsuitable wastes for RDF) and to provide job opportunities to waste pickers (WPs) who will loose job when the new disposal site will open as it will prohibit WPs from entering the site.
3. The MUB shall develop a site for the recycling complex next to the NEDS and to invite the private companies to locate their facilities there. Because it has the following advantages:
   - Recycling facilities require basic infrastructure such as access road, electricity and water which will be provided by the development of the new NEDS.
   - Recycling facilities need residue a disposal site.
   - The recycling complex will develop cooperation in a mutually complementary form if various kinds of recycling factories locate in the site.

Consequently, development of a recycling complex next to the NEDS is also proposed and is subject to the feasibility study and environmental impact (EIA) study.

a.2 Objective

A disposal site and recycling facilities of wastes could have a lot of impacts on the surrounding areas. In order to identify the impacts and to find out mitigation measures of them, the MUB will conduct the EIA survey according to the laws and regulations in Mongolia. Since local residents and local authorities are concerned about the consequences of the construction of the proposed disposal site and recycling facilities, due to the result of the UCDS, the MUB, the project owner decided to organize the first public hearing meeting, inviting all the stake holders such as local residents, local authorities and NGOs, before the EIA survey. The results of the first public hearing will be reflected in both the EIA survey plan and the proposed disposal site and recycling facilities development project.

b. Outline of the First Public Hearing Meeting

b.1 Date and Venue

Date: August 9th (Wed), 2005

Place: Meeting Hole of 3rd Khoroo, Baga Narangiin 44 Songinokhairkhan District in Ulaanbaatar City

b.2 Participants

Upon consideration of the objective of the first public hearing meeting, the participants will be invited from the following organizations:

- Officers of the central government
- Members of the Technical Working Group
- Representatives of Duureg and Khoroo governments near proposed site
- Residents near the proposed site
- Representatives of NGOs
- Mass Media

The number of participants of local residents and NGOs is shown below.

Local Residents			NGO	total
Khoroo 3	Khoroo 4	Unknown		
79	31	1	4	115

b.3 Program

The first public hearing meeting program is shown in the table below.

Topic	Expositor	Time
1. Registration	MUB	9:30 – 10:00
2. Opening Address by MUB	Mr. Ganbold Governor	10:00 – 10:15
3. Background of the Public Hearing Meeting	Mr. Delgerbayar	10:15 – 10:40
4. Outline of the Development Projects of New NEDS and Recycling Complex	Mr. Delgelbayar	10:40 – 11:10
5. Outline of the EIA Survey Plan	Mr. Otgonbayar, AGRAR	11:10 – 11:40
6. Question and Answer	MUB	11:40 – 12:20
7. Closing Speech by MUB	MUB	12:20 – 12:30

b.4 Result of Q & A

Several participants asked questions at the final session of the hearing. The result is summarized below.

Q1: Mr.Darisuren (Khoroo 4): The Mongolian Government has a law of inheritance as you know and it seems to me that when you do any operation for landfill you can face any danger to destroy some historic or cultural heritages unintentionally because the city of Ulaanbaatar (UB) is considered an area full of cultural and historical heritages such as Jamuh residence and a pit of ancient tombstone etc. So, did you get any permission or some thing gives you any right to work with the land from the Ministry of Culture?

Q2. Mr.Darisuren (Khoroo 4): Mr.Delgerbayar has spoken about methane so, do you have any research on how much does the disposal site has this methane and is there any acceptable standard of the methane gas generation at a disposal site?

A1:Mr.Delgerbayar: Good question. We selected Narangiin Enger from six possible sites and in order to select the most suitable site, the Natural Science Faculty of the Mongolian National University has conducted a field research to find out exactly what you said now about the historic and cultural heritage. Except that when we will do the EIA, I think we will take into our consideration this issue again. Mr. Shimura will answer the question concerning the methane gas.

A2: Mr.Shimura: The methane is generated by the anaerobic decomposition of mainly kitchen waste. Methane is an inflammable gas. The portion of kitchen waste in weight in winter is only 12.5 % of entire waste content according to the WACS (waste amount composition survey) in winter. The portion of kitchen waste in UB is very limited compare to those of other cities. For example, Adana in Turk of which population is almost same as UB,

1.2 million, and the portion of kitchen waste is 66 % and in Tokyo it is about 30 %. Therefore, the portion of methane gas generation here seems to be very low to compare to those cities. Although the methane generation gas is low, the project includes a gas removing facility in order to avoid accidents to be caused by the gas.
About a standard, there is no any acceptable standard of methane gas generation is fixed.

A2: Mr.Delgerbayar: We are going to install 16 pipes at the UCDS to remove the generated gas, in accordance with the Improvement Project of the UCDS. It will give us a good opportunity to examine gas removing process itself. It has been told that methane content is lower and as you know 60 % of waste is an ash waste.

A2: Mr.Otgonbayar: We will continue the research of the methane gas generation. Concerning the land survey, we will do the continuance research of everything that can impact to the environment. Of course, there should be a big impact to the environment. But according to the research survey we will give all acceptable amount of everything that can impact to the environment such as land use, fauna, flora etc. and then the disposal site and recycling complex will implement it.

Q3: Myagmar: Can we and livestock drink from the Tuul river which is close to the Songino? Maybe this question does not relate to this event but I am asking because it seems like there are some people who knows this issue too.

A3: Otgonbayar(Agrar): River water should not be uses as drinking water without analyses of its content. I really do not know about this part of Tuul river but the Tuul that close to the Leather factory has contaminated already. A Geo ecological Institute should do related analyses if you give them a sample for analyze.

Q4. Myagmar: Is there any frequent measurement concerning the analyses of water condition (content) in Mongolia?

A4: Mr.Batsaihan (MUB): Yes, there is a qualified laboratory which is in charge of this issue. For example the leather treatment factories are throwing their waste without premiere residue to the central cleaning facility of the city but now there is a project on process to settle this problem that provides from the Italian Government.

A4: Mr.Otgonbayar (Agrar): After the EIA we will draft special recommendation concerning the frequency of analyses of the disposal site and recycling complex and in accordance with the recommendation they will plan their budget.

c. Follow-up Survey

Some participants actively asked questions and no participants expressed their doubts or objection against the development plan. It is, however, necessary for the team and MUB to grasp how much participants understood the development plan and how do they evaluated them. For this purpose, the follow-up survey was conducted after the first public hearing.

c.1 Outline

Purpose

The survey aimed to grasp:

- How much participants understood the development plan
- How they evaluated the development plan

Survey method

The survey method was interview with questionnaire. Interviewers visited houses in order to make an interview.

Targets

The samples were selected randomly from the participant list of the first public hearing.

c.2 Result

The interview survey was conducted on September 7 and 10, 2006.

Samples

The total number of samples was 15, as shown below.

	Khoroo 3	Khoroo 4	total
Female	4	9	13
Male		2	2
total	4	11	15

Age	Khoroo 3	Khoroo 4	total
20 – 29		1	1
30 – 39		3	3
40 – 49	3	2	5
50 – 59		2	2
60 – 69		3	3
Unknown	1		1
total	4	11	15

Findings

The detailed result is shown in the databook. In this section, main findings are summarized below.

- Many respondents are confused with pilot project at the disposal site and the NEDS development plan.
- It seems that about half of respondents are working at UCDS (many of residents who live near the site of NEDS are waste pickers). They are concerned about the current pilot project more than the development plan of NEDS.
- Even though respondents reply that they remember or understand presentations, their understanding is very limited. (only one respondent understood the content of the public hearing very well)
- Since they are living near UCDS, most of them understood well what kind of place a final disposal site is and what kinds of problems could occur. But more than half of them were not concerned about possible problems, since they trust JICA. They are more interested in job opportunity and infrastructure improvement. As a result, all the respondents but one accepted the development plan (10 respondents accepted without conditions and 4 accepted with conditions).
- Most of respondents thought that JICA was responsible organization of the development plan.

8.2.2 Second Public Hearing

a. Background and Policy of the Project

a.1 Background

a.1.1. Development of a New NEDS

In Municipality of Ulaanbaatar (MUB), there are three official final disposal sites which are Ulaan Chuluut, Morin Davaa and Nalaikh Disposal Sites. Among the three official final disposal sites, Ulaan Chuluut Disposal Site (UCDS) is the biggest one receiving more than 90 % of the wastes generated in the City. The remaining service life of the UCDS is only few years and a residential area is approaching less than 800 m away from the site due to rapid expansion of the Ger Area. Therefore, a new disposal site for central 6 districts needs to be constructed as soon as possible and the existing site must be closed. Through the transparent selection process the Narangiin Enger was decided as the proposed future disposal site for the central 6 districts in MUB officially at the the Steering Committee (St/C) meeting of the JICA SWM Study on April 20th 2005. In response to the decision, development of the new NEDS is proposed to replace the UCDS and is subject to the feasibility study.

a.1.2. Development of a Recycling Complex

The fundamental goal of the M/P for SWM in MUB is to establish an environmentally sound SWM system in MUB by the target year 2020. To achieve this goal, 3Rs (Reduce, Reuse, Recycle) will be actively promoted to reduce waste generation at first, then to reuse and recycle generated wastes as a resource as much as possible in order to reduce the amount of the solid waste to be disposed of at the landfills.

As for the promotion of 3Rs, recycling activities shall be conducted by the private sector in principle. The role of public sector (MUB) shall be limited to:

- Promote, support and regulate the recycling activities of private sector.
- Research, introduce and disseminate technologies to recycle the wastes that the private sector can not deal with.

The development project of a recycling complex next to the NEDS is identified to pursue the role of public sector (MUB) mentioned above. The project is divided into the following phases:

Phase 1 (Target year 2010):

Construction of a sorting yard and a RDF (Refuse Derived Fuel) plant and development of basic infrastructures (such as access road, electricity, water, etc.) for new private investors of recycling business

Phase 2 (Target year 2020):

Promotion of investment by private recycling enterprises

The Phase 1 of the project is subject to the feasibility study, which examines the viability of the project.

a.2 Policy

a.2.1. The New NEDS

The policy of the development of NEDS is established as follows:

1. A new disposal site shall be developed to minimize and mitigate adverse impacts (by landfill operation) to the surrounding environment as much as possible;
2. The site shall be operated by the sanitary landfill method, which conducts immediate compaction of waste, daily cover of waste disposed, etc.; and
3. Therefore, since the activities of waste pickers at the disposal site impede the sanitary landfill operation, the entrance of them to the site shall be prohibited.

a.2.2. The Recycling Complex

The policy of the development of Recycling Complex Phase 1 is established as follows:

1. Main purposes of the project are:
   - To promote the recycling activities of private sector and introduce technologies to recycle the wastes that the private sector can not deal with; and
   - To create job opportunities to the residents around the new NEDS and waste pickers working at current UCDS in order to obtain consensus on the development of it from them.
2. The MUB shall develop a site for the recycling complex next to the NEDS and to invite the private enterprises to locate their facilities there. Because it has the following advantages:
   - Recycling facilities require basic infrastructure such as access and on-site road, electricity and water which will be provided by the development of the new NEDS.
   - The recycling complex will develop cooperation in a mutually complementary form if various kinds of recycling factories locate in the site. For instance, a plastic bag production company will be able to purchase their raw materials from sorting yards, An enterprise exporting scrap metal to China can purchase their materials from sorting yards and also use compaction machine provided at the yard.
   - Recycling facilities need a disposal site for residue to be generated by processing raw materials (wastes).
3. Objectives of the sorting yard are:
   - To provide work opportunities to current waste pickers in UCDS in order to prevent the NEDS from their entering and to ensure sanitary landfill operation at the NEDS. Therefore, the facility shall limit use of machinery as much as possible;
   - To promote reuse/recycle of wastes; and
   - To pre-treat wastes for RDF production.
4. Purposes of the RDF plant are:
   - To mitigate problems for the sanitary landfill operation; i.e. scattering wastes and spoiling stability of landfill, by reducing problem some wastes such as plastics and papers; and
   - To introduce and disseminate a thermal recycling technology of RDF that the private sector can not deal with at present and can recycle problem some wastes.

b. Objective of the Second Public Hearing Meeting

A disposal site and a recycling complex of wastes could have a lot of impacts on the surrounding areas. In order to identify the impacts and to find out mitigation measures of them, the MUB conducted the EIA survey according to the laws and regulations in Mongolia. Since local residents and local authorities are concerned about the consequences of the construction of the proposed disposal site and recycling complex, due to the result of the UCDS, the MUB, the project owner decided to organize the second public hearing meeting, inviting all the stake holders such as local residents, local authorities and NGOs, to explain the result of the EIA survey. The results of the second public hearing will be reflected in the proposed disposal site and recycling complex development project.

c. Outline of the Second Public Hearing Meeting

c.1 Date and Venue

Date: October 19th (Wed), 2005

Place: School of 3rd Khoroo, Narangiin 44 Songinokhairkhan District in Ulaanbaatar City

c.2 Participants

Upon consideration of the objective of the second public hearing meeting, the participants will be invited from the following organizations:

- Officers of the central government
- Members of the Technical Working Group
- Representatives of Duureg and Khoroo governments near proposed site
- Residents near the proposed site
- Representatives of NGOs
- Mass Media

The number of local participants and NGO is shown below.

Local Residents		NGO	Total
Khoroo 3	Khoroo 4		
62	26	3	91

c.3 Program

The second public hearing meeting program is shown in the table below.

Topic	Expositor	Time
1. Registration		17:30: –18:00
2. Opening Address by MUB including Background of the Public Hearing Meeting	MUB	18:00 – 18:10
3. Outline of the Development Plan of New NEDS and Recycling Complex	Mr. Dergerbayar MUB	18:10 – 18:40
4. Outline of the EIA Survey and its result ✓ What is EIA ✓ The result of EIA and mitigation measures	Mr. Otgonbayar Norov General Director AGRAR Co., Ltd.	18:40 – 19:10
5. Question and Answer	MUB	19:10 – 19:50
6. Closing Speech by MUB	MUB	19:50 – 20:00

c.4 Result of Q & A

At the second public hearings, several participants asked questions. The result of the session of Q&A is summarized below.

Q1 (4 questions) - Mr. Bumyalagch, Green Party (NGO):
I have several (4 questions were asked) questions regarding your project. The first one is "how does water change into steam during winter time?" Second, As far as I know RDF is dangerous. I heard that an RDF factory caused damage in Japan because of its improper technology. How we can introduce RDF into practice if developed countries like Japan could not solve its technology properly. You just mentioned RDF must burn in high temperatures, more than 800. If we burn it in lower temperatures, RDF may cause lung cancer. Third, According to the law, the EIA survey must be approved after getting people's opinions and comments. And you just mentioned that you submitted your survey for approval. It means that you have submitted your survey for approval before getting people's opinions and comments. Is that fair? Fourth, how many local people would be employed in the new disposal site? Thank you.

A1 - Delgerbayar (MUB):
- About Third Question, we got the local people's opinions in August. We organized the first public hearing meeting with local people on 9th August, 2005. And this is the material (he showed to the audience) that contains the people's opinions and comments about the project.
- As for First Question, there would be no water in the disposal site in winter time. Because 60% of the wastes disposed of in winter is ash. And only 12 % of the wastes disposed of are kitchen wastes which may produce leachate, contaminated water. We will have a dam to prevent flooding in summer time.
- About Question Four, I cannot tell now how many people might be employed in the new disposal site. We have 520 tons of waste in winter, around 300 tons of waste in summer time. And only 7% of all waste can be reused.
- In Japan 70-80 % of wastes are incinerated. About RDF, there are a lot of technologies available for RDF in Japan. There are some plants which apply to the same RDF technology as our proposed one; i.e. use mainly waste plastics and papers. I visited 3 RDF factories in Japan. One of them is RDF plant in Sapporo which only uses waste plastics, papers, and woods for RDF production and 60% of the wastes used are plastics and papers. In our case, we proposed to combust less than 5% of RDF together with more than 95% of the coal at the existing power stations. As for a pilot combustion test at the Nalaikh heating plant, we have produced 12 tons of RDF. A Japanese specialist for RDF was invited for the test. It is a pilot project. If RDF creates poisonous items such as dioxins, we would take the necessary measures.

A1 – Mr. Shimura:
It is true some RDF plants in Japan caused environmental problems due to mainly use of kitchen wastes for RDF production. Our proposed RDF plan shall not use the kitchen wastes and only allows inert combustible wastes like papers and plastics. The RDF plant in Sapporo has been in operation for about 20 years and the RDF produced in the plant has been used as fuel for heating plants. It did not create any problems. We will conduct a mixed combustion test of RDF with coal at the Nalaikh heating plant. I would like to invite you (Mr. Bumyalagch) to the test to inspect the results of the test.

A1 - Mr. Otgonbayar (Agrar):
- About Third Question, we got comments from 70 citizens of Khoroo No. 3 and 4, Songinonkhairhan district. Please read our survey carefully.
- As for First Question, there is a lot of ash. And water is absorbed by ash. It means that there would not be any problems regarding water especially in winter time. We should thank the Japanese. There would be huge structure in the disposal site for us.

Q 2 – Local residents:
How many people would be employed in a new disposal site?

A2 - Delgerbayar:
I can not say now. When the proposed infrastructure would be established, there would be some job opportunities for those people who are willing to work. People can initiate new ideas on how to use the disposal site.

Q 3 – Local residents:
Do people in Khoroo No. 3 and 4 have more of an advantage to be employed?

A3 - Delgerbayar:
A rule would be made for the employment. These people have more advantage than other people.

Q 4 - Bumyalagch, Green Party:

You have shown some financial calculations. How would inflation influence your calculation?

A4 -Delgerbayar:
This calculation would be changed according to the inflation rate.

d. Follow-up survey

Same as the first public hearing, the follow-up survey was conducted after the second hearing. This time, the survey aimed to grasp how much the understanding level of participants was changed, as well as how they evaluated the development plan.

d.1 Outline

Purpose

The survey aimed to grasp:

- How much participants understood the development plan, compared to the time of the first hearing.
- How they evaluated the development plan

Survey method

The survey method was interview with questionnaire. Interviewers visited houses in order to make an interview.

During the interview survey, the interviewer encouraged the respondent to answer freely to multi-answer questions, rather than asking them to select appropriate answers from the lists. This made it possible for us to evaluate the level of their understanding more precisely.

Targets

The samples were selected randomly from the participant list of the first public hearing.

d.2 Result

The interview survey was conducted for 4 days from November 14 to November 19, 2006.

Samples

The total number of samples is 30. The distribution of samples by Khoroo, age, and sex is shown below.

	Khoroo 3	Khoroo 4	total
Female	10	12	22
Male	5	3	8
total	15	15	30

Age	Khoroo 3	Khoroo 4	total
20 – 29		3	3
30 - 39	2	1	3
40 – 49	3	4	7
50 – 59	3	5	8
60 – 69	4	1	5
70 – 79	3	1	4
total	15	15	30

The samples are also divided into two groups: (1) those who attended the first public hearing and (2) those who attend the hearing for the first time.

First Public Hearing	Khoroo 3	Khoroo 4	Total
Attended	2	5	7
Not attended	13	10	23
Total	15	15	30

Findings

The detailed result of the survey is shown in the databook. In this section, main findings are summarized below.

- In Khoroo 4, a majority of residents knew about the development plan before the second public hearing, while there were still many people who did not know it in Khoroo 3.
- Participants from Khoroo 4 understood about landfill operation better than those from Khoroo 3. It can be said that the pilot projects in Khoroo 4 raised the level of their understanding.
- It seemed still difficult for most of the participants to understand correctly about the the EIA survey and its result. However, most of them recognized well possible problems caused by the new disposal site, due to their experiences and knowledge of existing disposal site at Ulaan Chuluut.
- More than 80% of the respondents still thought that JICA was a responsible organization of the development plan, regardless that MUB took an initiative at the hearing.
- Basically, all the respondents agreed with the development plan, although they recognized the risks of the disposal site. It is probably because they believed that support from JICA could prevent or mitigate these problems. Moreover, they expected the benefits of the development plan such as the pavement of the access road and job creations.

8.2.3 Third Public Hearing

a. Objective of the Third Public Hearing Meeting

A disposal site and a recycling complex of wastes could have a lot of impacts on the surrounding areas. In order to identify the impacts and to find out mitigation measures of them, the MUB conducted the EIA survey according to the laws and regulations in Mongolia as follows:

1. Initial Environmental Examination (IEE) was conducted by Ministry of Environment (MOE) on 20th June 2005 and the project proponent, MUB, was ordered to carry out Environmental Impact Assessment (EIA) according to the result of IEE. The MUB contracted out the EIA survey work to a local consultant, Agrar Co., Ltd.
2. Baseline survey started on 4th in August and continued until 17th in August, 2005. During the survey first Public Hearing Meeting was held on 9th August 2005 and comments from stakeholders including local residents were submitted by the end of August 2005.
3. The assessment of the impacts was carried out from 15th August to 15th September 2005 and a draft EIA report was submitted to MOE on 15th September 2005.

4. The second public hearing meeting was held on 19th October 2005 and comments from stakeholders including local residents were collected by the end of October, 2005.
5. The local consultant, Agrar Co., Ltd. revised the EIA report based on the instruction made by MOE and modified development plan of NEDS/NERC which took the comments from the public hearing meetings into consideration. Then the consultant submitted the revised EIA report to the MOE on January 11th, 2006.
6. After the examination of the revised EIA report, the MOE finally approved the EIA report of the development project of NEDS and NERC on February 6th, 2006.

In order to explain the revised EIA report and development projects of NEDS and NERC, the MUB, the project owner, decided to organize the third public hearing meeting, inviting all the stake holders such as local residents, local authorities and NGOs. The results of the third public hearing will be reflected in the proposed disposal site and recycling complex development project.

b. Outline of the Third Public Hearing Meeting

b.1 Date and Venue

Date: May 10th (Wed), 2006

Place: No. 65 School of 3rd Khoroo, Narangiin 44 Songinokhairkhan District in Ulaanbaatar City

b.2 Participants

Upon consideration of the objective of the third public hearing meeting, the participants will be invited from the following organizations:

- Officers of the central government
- Members of the Technical Working Group
- Representatives of Duureg and Khoroo governments near proposed site
- Residents near the proposed site
- Representatives of NGOs
- Mass Media

The number of local participants and NGO is shown below.

Local Residents		NGO	Total
Khoroo 3	Khoroo 4		
84	45	3	132

b.3 Program

	Topic	Expositor	Time
1.	Registration		16:00: –16:30
2.	Opening Address by MUB including Background of the Public Hearing Meeting	Mr. Ch.Batsaikhan MUB	16:30 – 16:40
3.	Outline of the Development Plan of New NEDS and Recycling Complex	Mr. B.Delgerbayar MUB	16:40 – 17:20 (40 minutes)
4.	Outline of the EIA Survey and its result	Mr. N.Otgonbayar AGRAR	17:20 – 17:40 (20 minutes)
5.	Question and Answer		17:40 – 18:30 (50minutes)
6.	Closing Speech by MUB including upcoming schedule	Mr. Ch.Batsaikhan MUB	18:30 – 18:40

b.4 Result of Q & A

The result of the session of Q&A is summarized below.

Outline of the Development Plan of New NEDS and Recycling Complex

Question 1 – Mr. Gankhuyag (Mongolian Green Party):

Just before, Mr. Delgerbayar presented 9.1 million dollar of budget for Grant aid. I think the budget is too much. I have a project of new recycle complex. (He showed some materials). It will be constructed by low cost. This project's budget is lower than your project's budget. 80-90 percent of all waste is recyclable. So, the budget of Grant aid is too much. Isn't it?

Answer 1– Delgerbayar (MUB):

We will not construct only NERC by using this budget. We need budget to buy waste collection trucks also. Nowadays, 80-100 trucks collect waste in UB city everyday. But trucks are not enough. Those trucks can't collect all the waste from all the area. Therefore, it is important to increase number of collection trucks. Procurement of trucks will cost a lot and occupy greater parts of the budget.

Also we need budget to procure bulldozers, dump trucks and excavators in the new disposal site. For example, one 20 ton new Komatsu bulldozer costs 200,000$.

We planned to lay asphalt road from existing paved road to NEDS as an access road. The cost is 180-200 million Tg for laying only 1 kilometer road. NERC will be supplied with heating system and electricity. You know, it is very expensive. In view of this, 9.1 million dollar of the budget is not too much. On the contrary, the budget is almost insufficient.

Second issue is about recycling. We will promote the recycling activities of private sectors. You can run recycling business too. We are ready to permit for recycling activities of PET bottles and glass bottles etc. There are many advantages such as to create new jobs for local residents. For example: local residents of khoroo 3 and 4 will be supplied workplace in the RDF factory and in the work of construction of road.

Furthermore, collection of waste will be done by private sector too.

Question 2 – Erdenebat (Mongolian Green Party):

Are there any adverse environmental impacts in Landfill operation?

Answer 2 – Delgerbayar (MUB):

Waste will decompose under the soil and discharge leachate. Therefore, the leachate collection pipes will be installed in order to prevent leachate for penetrating into underground. The leachate will be collected and flow inside leachate pipes and in the end it will be collected into Leachate pond. The leachate pond will be lined with impermeable liner in order to prevent leachate from penetrating into the ground.

So, Study team leader Mr. Shimura will explain about negative impact on environment when waste will be accumulated under the soil for a long time.

Answer 2 - Mr. Shimura (Study team) :

We researched the soil strata of NEDS. There is a hard rock below two to four meters from ground level. Therefore it is difficult for leachate to penetrate into underground water.

In the surface of the landfill area, leachate collection pipe with hole will be installed. And leachate will be flow inside this pipe up to leachate collection pond.

In generally, sanitary landfill operation is a simple measure to protect environment. When conduct to soil cover to the waste, waste is not scattered by wind and does not burn and there will be no bad smell. Sanitary landfill operation could be a measure of the nature protection.

Outline of the EIA Survey and its result

Question 3 – local resident:

I understood condition of UCDS. I'd like to ask one thing. Is sewerage treatment plant in Tolgoit included in your study?

Answer 3 – Delgerbayar (MUB):

Our project is related to solid waste management. The sewerage treatment plant is not related to our project. Based on my understanding, a project will be implementing with one million dollar of the budget. But I can't tell this issue exactly.

Question 4 – Erdenebat (Mongolian Green Party):

Is it possible to reuse 100 percent of all the waste without landfill?

Answer – Delgerbayar (NUB):

In generally, waste is valuable. If we can reuse and recycle all the waste, landfilling is not required theoretically. But reality, it is not possible. If you can reuse and recycle the waste, we will promote your business activities. Sorting yard will be constructed with aiming to promote recycling activities.

Question 5 – Local resident:

How about the countermeasures to take care waste pickers who are now working at UCDS in future?

Answer 5 – Delgerbayar (MUB):

One of Japanese government ODA policy is to support poor people's livelihood. Therefore, we don't prejudice waste picker's workplace. We take care how to supply workplace to waste pickers and how to make local residents understand about recycling efficiency.

c. Follow-up Survey

c.1 Outline

Purpose

The survey aimed to grasp:

- How much the level of understanding of local residents was deepened, as three public hearings were organized.
- How they evaluated the development plan

Survey method

The survey method was interview with questionnaire. Interviewers visited houses in order to make an interview.

Targets

The samples were selected randomly from the participant list of the first public hearing.

c.2 Result

The interview survey was conducted on June 11, 14, 17, and 18 (for 4 days).

Samples

Forty samples were selected randomly based on the attendant list, but some of the samples could not be reached because of their absence, wrong address, and so on. The number of the final valid samples was 25, and the breakdown of the samples by Khoroo is shown below.

Age	Khoroo3	Khoroo4	total
30s	4	2	6
40s	4	4	8
50s	6		6
60s	2	1	3
70s		2	2
total	16	9	25

	Khoroo3	Khoroo4	total
Female	13	5	18
Male	3	4	7
total	16	9	25

About the half of respondents attended the public hearing for the first time.

Findings

The detailed result of the follow-up survey is shown in the databook. In this section, main findings are summarized below.

- Even though some respondents were still confused with the development plan of NEDS and the pilot project at the UCDS, the majority of respondents recognized the development plan.
- It can be said that most of the respondents understood the basic functions of the disposal site. It can be attributed to various activities conducted under the JICA study.
- Even though respondents know the problems at the UCDS, more than 70% of the respondents replied that they did not assume any social and environmental risks.
- Regarding the NERC development plan, all the respondents recognized the sorting yard, while their understanding of the RDF facilities seems limited.
- Eighty percent of the respondents still consider JICA the main responsible organization of the development project, even though MUB took an initiative at the hearing. This might be one of main reasons why many respondents did not assume any risks from the new disposal site.
- Regarding the responsible organization for operating and managing the new disposal site, nobody selected the Nuut. Co. as the main responsible organization.
- Except the location of the NEDS, most of the respondents agree with the development plan. Some of them were concerned about the location of the disposal site, which is located on the windward of the city center.
- Basically, the respondents agreed with both the NEDS and NERC development plans.
- The level of their understanding of the disposal site, however, is still limited but deepened.

9. Minutes of Meeting

9 Minutes of Meeting

9.1 Minutes of Meeting No.1 on 10th December 2004

ORIGINAL: ENGLISH

MINUTES OF MEETINGS
ON
THE INCEPTION REPORT
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON AMONG

MINISTRY OF FINANCE
MINISTRY OF NATURE AND ENVIRONMENT
ULAANBAATAR CITY GOVERNMENT
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar City, 10th December 2004

KHURELBAATAR Chimed
State Secretary
Ministry of Finance

SHIMURA Susumu
Leader of the JICA Study Team

ADIYA Yansanjav
State Secretary
Ministry of Nature and Environment

MUNKHBAYAR Gombosuren
General Manager of Ulaanbaatar City
and Chairman of the Governor's
Office

Witnessed by

KITAWAKI Hidetoshi
Chairman of JICA Advisory Committee

MINUTES OF MEETINGS ON THE INCEPTION REPORT OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The JICA Study Team (the Team) has submitted the following number of copies of the Inception Report (IC/R) to the Governor's Office, Ulaanbaatar City Government.

Items Kind of Report	Language	Number of Copies
1. Inception Report	English	10
2. Inception Report	Mongolia	40

Consequently a series of meetings was held from 3rd to 9th December in Ulaanbaatar City to discuss the report submitted. A list of officials attending the above meetings is given in Appendix 1.

2. ISSUES AND DECISIONS

2.1 Various issues were discussed and clarifications on the IC/R were made. Subsequently appropriate consensus on the major items of the IC/R including the objectives, the major study components, the work schedule and others was reached during the meetings. These issues, clarifications and consensus are outlined as follows.

2.2 Members of Counterpart Team (C/P)

The Mongolian side informed that the following members from Ulaanbaatar City Government were appointed as the counterpart personnel to the Team:

No	Name	Position
1	Mr. BAT Choimpog	Chief of City Development, Strategical Policy and Planning Department, Ulaanbaatar City Government
2	Dr. BATSAIKAN Chultemsuren	Officer of the City Development, Strategical Policy and Planning Department, Ulaanbaatar City Government
3	Mr. BOLD Tsegmid	Head of the Public Service Department, Governor's Office
4	Mr. DELGERBAYAR Badam	Officer of the Public Service Department, Governor's Office
5	Ms. BUYANJARGAL Tumurbaatar	Officer of the Public Service Department, Governor's Office

The Team acknowledged the appointment.

2.3 Member of Steering Committee (St/C) and Technical Working Group (TWG)

The Team explained the functions and tasks of the St/C and the TWG, and requested the Mongolian side to appoint the member of the committee and the group.

The Mongolian side replied that the officers attached in Appendix 2 were appointed as the members of the St/C and TWG (subject to be changed). According to the appendix, the chairman of St/C is the State Secretary of the Ministry of Nature and Environment, deputy chairman is the General Manager of Ulaanbaatar City and the secretary of St/C is the Head of the Public Service Department, Governor's Office (The joint order by the Minister of Nature and Environment and the Mayor of UBC to establish the St/C is attached to this Minutes of Meetings).

The Team appreciated the appointment.

2.4 Attendance to the Weekly Meeting

The Team explained the policies of the study; i.e. conduct of the Capacity Development and formulation of a Practical Master Plan. Then, the Team requested the C/P personnel to participate in the study work as much as possible; for instance, use about one third to half of their working hours to the study. As for the permanent member of the TWG, the Team requested them at least to attend the weekly meeting for smooth implementation and understanding of the study.

The Mongolian side acknowledged the request.

2.5 Procedure and Schedule of Site Selection for Proposed New Disposal Site

The Team explained the selection procedure and schedule of the sites for solid waste management facilities, especially final disposal sites, as shown below. Then the Team requested the Mongolian side to present candidate sites by mid-January 2005 in order to formulate practical M/P with consensus among the stakeholders.

December, 2004	➢ 1-10: Explanation of the procedure/schedule of the site selection and request for the candidate sites by the Team
January, 2005	➢ 11-20: Presentation of the candidate sites by the Mongolian side ➢ 21- 31: Collection of data and reconnaissance of the sites by the Team
February, 2005	➢ 1-20: Screening of the sites by the Team ➢ 21-28: Presentation of the M/P alternatives by the Team => Approval of the alternatives to be examined by the St/C
March, 2005	➢ Examination of the alternatives by the Team
April, 2005	➢ 1-10: 2nd Workshop => Recommendation of the optimum alternative by the Workshop => Selection of the optimum one by the St/C ➢ 11-20: 1st Seminar => Consensus on the optimum alternative => Completion of site selection work
May, 2005	➢ Formulation of a draft M/P and discussion by the Team

The Mongolian side, in principle, acknowledged the procedure and schedule.

2.6 Proposal by the Mongolian Side

As for the site selection of a new final disposal site(s) and a pilot project for the final disposal system, the Mongolian side proposed to take the following procedures:

1. A joint working group for the identification of the location for a New Final Disposal Site would be established by the joint order by the Minister of Nature and Environment and the Mayor of UBC and should commence its task.
2. The joint working group should conduct researches on the closure of Ulaan Chuluut final disposal site and the location of the new final disposal site(s) and submit its proposal to the St/C within the first quarter of the year 2005.
3. Among the candidate sites, an optimum one where landfilling should be established will be selected. Both sides should, firstly, pay attention to the possibilities to conduct the pilot projects at the selected site.
4. The both parties should consider the possibility to set the starting date of the pilot projects earlier and cooperate on the selection of the optimum alternative.
5. A pilot project, which includes rehabilitation and sanitization of the existing disposal site, should be conducted.

The Team appreciated the site selection procedure to be done by the Mongolian side. The Team, however, stated the Mongolian side that based on the study objectives and technical cooperation scheme of JICA the pilot project could not deal with the new disposal site to be selected.

The Mongolian side approved the statement.

2.7 Counterpart Training in Japan

The Mongolian side requested the JICA Study Team to provide training opportunities in Japan as a part of Capacity Development scheme.

The Team replied that it will convey the request to JICA Headquarters.

3. CONCLUSION

3.1 Both sides agreed that technical discussions would be continued during the Study at the weekly meetings, due to limited time and their technical nature.

3.2 Following the intensive and technical discussions among participants held, the IC/R was fully approved by the both sides.

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Appendix 1

ATTENDANT LIST

<Mongolian Side>

Ministry of Finance:	
Mr. ZORIGT Dashdorj	Director-General of the Department of Economic Cooperation Policy and Coordination
Mr. TUGULDUR Baajiikhuu	Officer of the Department of Economic Cooperation Policy and Coordination
Ministry of Nature and Environment	
Dr. ADIYA Yansanjav	State Secretary of Ministry of Nature and Environment
Dr. NAMKHAI Ayush	Director-General of Department of Sustainable Development and Environment
Mr. BAYASGALAN Banzragch	Deputy Director of Department of Sustainable Development and Environment
Ms. OYUNDAR Navaan-Yunden	Director of the International Cooperation Department
Ms. ZOLJARGAL Manaljav	Officer of Department of Sustainable Development and Environment
Ms. ERDENETSETSEG Sugar	Secretary of Environmental Impact Assessment Working Group, Department of Sustainable Development and Environment
Mr. ERDENEBULGAN Davaa	Senior Officer of International Cooperation Department
Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Mr. BAT Choimpog	Chief of City Development, Strategical Policy and Planning Department
Mr. BOLD Tsegmid	Head of Public Service Department, Governor's Office
Mr. DELGERBAYAR Badam	Officer of Public Service Department, Governor's Office
Ms. BUYANJARGAL Tumurbaatar	Officer of Public Service Department, Governor's Office
The Specialized Inspection Department of Ulaanbaatar City	
Ms. OYUNTSETSEG Nyamjav	Inspector of Nature and Environment

<Japanese Side>

JICA Study Team	
Mr. SHIMURA Susumu	Team Leader / Capacity Development
Mr. SUZUKI Tamotsu	SWM Facility Planning / Environmental Consideration.
Mr. KONO Ichiro	Recycling System / Hazardous Waste / Pilot Project
Ms. KUNITSUKA Ikuko	Construction Planning / Cost Estimation
JICA Mongolia Office	
Mr. KANZAKI Yoshio	Resident Representative
Mr. OTA Masaaki	Assistant Resident Representative
Ms. SAIKHANTUYA Algaa	Program Officer
JICA Head Quarter	
Mr. MURATA Takuya	Environmental Management Team II, Group II Global Environment Department
JICA Advisory Committee	
Prof. KITAWAKI Hidetoshi	Leader of Advisory Committee
Mr. NAGASE Yutaka	Member of Advisory Committee

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Appendix 2

MEMBER LIST

Steering Committee

Assignment	Name	Position and Organization
Chairman of the St/C	ADIYA Yansanjav	State Secretary of the Ministry of Nature and Environment
Deputy Chairman	MUNKHBAYAR Gombosuren	General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Secretary	BOLD Tsegmid	Head of the Public Service Deparment, Governor's Office
Member	NAMKHAI Ayush	Head of the Department of Sustainable Development and Environment, Ministry of Nature and Environment
Member	OYUNDARI Navaan-Yunden	Head of the Department of International Cooperation, Ministry of Nature and Environment
Member	ZORIGT Dashdorj	Director-General of the Department of Economic Cooperation Policy and Coordination, Ministry of Finance
Member	GANKHUU Tsevelsodnom	Head of the Department of Construction and Public Service Policy Adjustment, Ministry of Construction and City Development
Member	BADARCH Dorjsuren	Head of the Department of Industrial Policy Adjustment, Ministry of Industry and Trade
Member	ENKHTSETSEG Shinee	Officer for Environmental Social Health Affairs of the Policy Adjustment Department, Ministry of Health
Member	ARIUNZUL Yungiv	Head of the Department of Environment, Geodesy and Cartography Inspection, State Specialized Inspection Agency
Member	BAT Choimpog	Chief of the Department of City Development, Strategical Policy and Planning Department, Ulaanbaatar City Government
Member	GALSANPUNTSAG Gombosuren	Chief of the Specialized Inspection Department of Ulaanbaatar City
Member	LKHANAAJAV Mijidgombo	Chief of the Educational Department of Ulaanbaatar City
Member	MUNKHTSOG Doltson	Chief of the Department of Housing Service and Utilities
Member	JARGALSAIKHAN Shatarkhuu	Chief of the Steering Committee of Apartment Owners' Unions
Member	SHARAVDORJ Chimeddorj	President of the Union of Mongolian Ecologists
Member	SODNOMPIL Namdag	President of "Baigali Erdene San" NGO

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Technical Working Group

Assignment	Name	Position and Organization
Chairman of the TWG		Chief of City Development, Strategical Policy and Planning Department, Ulaanbaatar City Government
Deputy chairman		Head of the Public Service Department, Governor's Office
Member		Officer of Department of Sustainable Development and Environment, Ministry of Nature and Environment
Member		Officer for Environmental Social Health Affairs of the Policy Adjustment Depart, Ministry of Health
Member		Officer of Industrial Policy Adjustment Department, Ministry of Industry and Trade
Member		Chief of the Department of Nature and Environment of Ulaanbaatar City
Member		Director of the Institution of Urban Planning, Research and Design, Ulaanbaatar City Government
Member		Head of Natural and Infrastructural Inspection Division, Specialized Inspection Department of Ulaanbaatar City
Member		Senior Officer for Budget of the Department of Finance, Economy and Budget, Ulaanbaatar City Government
Member		Chief of the Central Water Treatment Facilities of Ulaanbaatar City
Member		Director of "NUUTS" Company
Member		Director of "Khan Uul" District Renovation Company
Member		Head of the Department of Public Service and Utilities, Chingeltei District Government
Member		Vice Chief of the Department of Housing Service and Utilities
Member		Head of IT Center, Department of City Development and Investment
Member		Head of Land Information Center, Department of Land of Ulaanbaatar City
Member		Officers of the Public Service Department, Governor's Office (3 persons)
Member		Vice-President of "Baigali Erdene San" NGO
Member		Vice-President of the Union of Mongolian Ecologists
Secretary		Officer for Ecological Policy of the Department of City Development, Strategic Policy and Planning, Ulaanbaatar City Government

6

МОНГОЛ УЛСЫН БАЙГАЛЬ ОРЧНЫ САЙД,
НИЙСЛЭЛИЙН ЗАСАГ ДАРГЫН ХАМТАРСАН
ТУШААЛ ЗАХИРАМЖ

2004 оны 12 дугаар сарын 09 өдөр Дугаар 228/534 Улаанбаатар хот

Төслийн удирдах зөвлөл байгуулах тухай

Монгол Улсын "Үйлдвэрлэлийн болон ахуйн хог хаягдлын тухай" хуулийг хэрэгжүүлэх, хотын атаарын бохирдлыг багасгах, хог хаягдлын менежментийг боловсронгуй болгох зорилгоор ТУШААН ЗАХИРАМЖЛАХ нь:

1.Улаанбаатар хотын хуурай хог хаягдлын менежментийг сайжруулах төслийн Удирдах зөвлөлийг дараахь бүрэлдэхүүнтэйгээр байгуулсугай. Үүнд:

Удирдах зөвлөлийн дарга	Я.Адъяа	Байгаль орчны яамны Төрийн нарийн бичгийн дарга
Орлогч дарга	Г.Монхбаяр	Улаанбаатар хотын ерөнхий менежер
Нарийн бичгийн дарга	Ц.Болд	Захирагчийн ажлын албаны Хот тохижилтын хэлтсийн дарга
Гишүүд	А.Намхай	Байгаль орчны яамны Тогтвортой хөгжил, хүрээлэн буй орчны газрын дарга
	Н.Оюундарь	Байгаль орчны яамны Хамтын ажиллагааны хэлтсийн дарга
	Ц.Ганхүү	Барилга хот байгуулалтын яамны Барилга, нийтийн аж ахуйн бодлого, зохицуулалтын газрын дарга /зөвшилцсөнөөр/
	Д.Бадарч	Үйлдвэр худалдааны яамны Үйлдвэрийн бодлого, зохицуулалтын газрын дарга /зөвшилцсөнөөр/
	Д.Зоригт	Сангийн яамны Эдийн засгийн хамтын ажиллагааны бодлого, зохицуулалтын газрын дарга /зөвшилцсөнөөр/
	Ш.Энхцэцэг	Эрүүл мэндийн яамны Бодлого, зохицуулалтын газрын орчны нийгмийн эрүүл мэндийн асуудал хариуцсан мэргэжилтэн /зөвшилцсөнөөр/

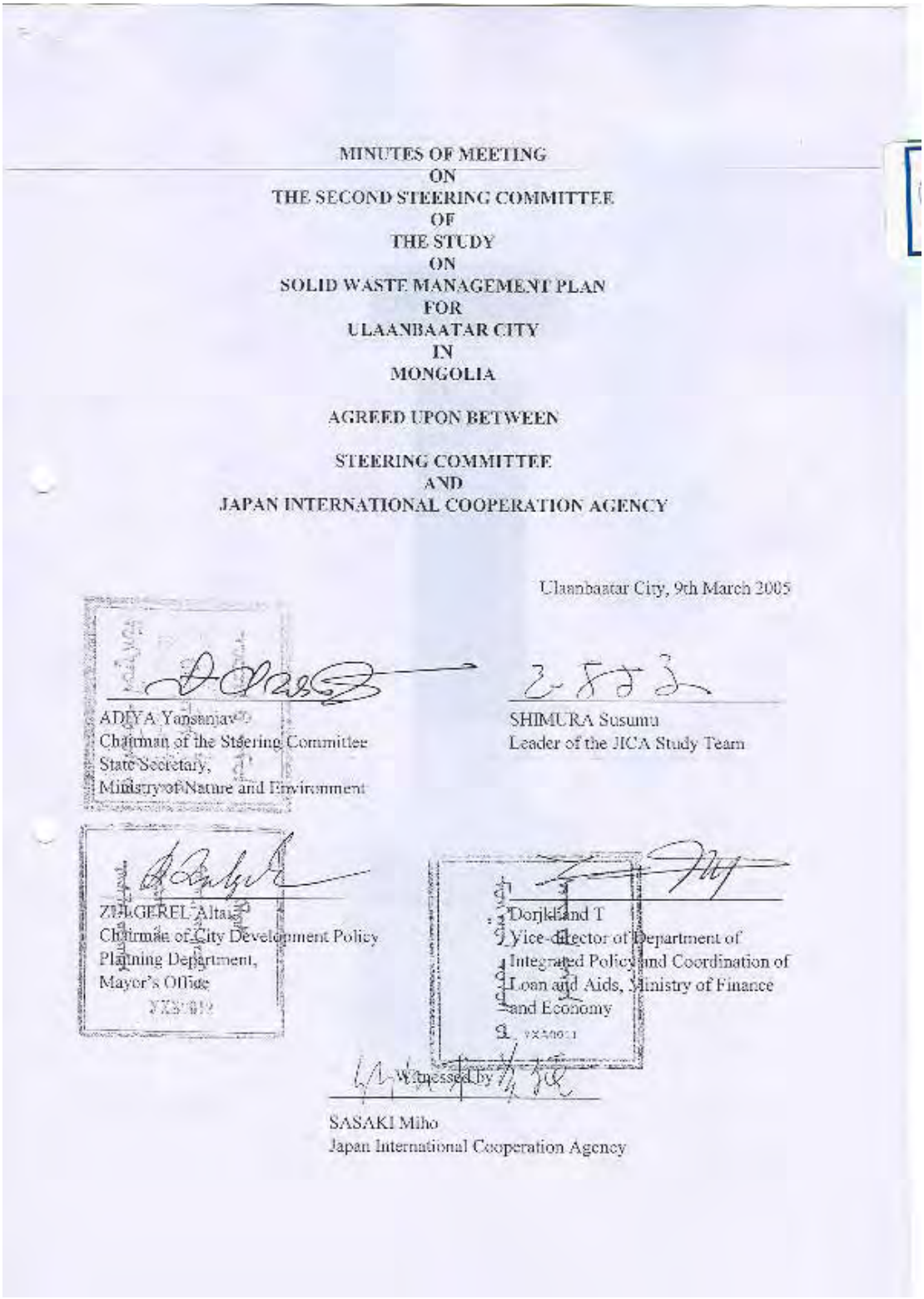
Ч.Бат	Нийслэлийн Засаг даргын Тамгын газрын Хот байгуулалт, стратегийн бодлого, төлөвлөлтийн хэлтсийн дарга
Я.Ариунзул	Улсын мэргэжлийн хяналтын газрын Байгаль орчин, геодези, зураг зүйн хяналтын албаны дарга
Г.Галсанпунцаг	Нийслэлийн мэргэжлийн хяналтын газрын дарга
М.Лханаажав	Хотын боловсролын газрын дарга
Д.Монхцог	Орон сууц, нийтийн аж ахуйн газрын дарга
Ш.Жаргалсайхан	Сууц өмчлөгчдийн холбооны дээд зөвлөлийн гүйцэтгэх захирал /зөвшилцсөнөөр/
Ч.Шаравдорж	Монголын Экологчдын холбооны тэргүүн /зөвшилцсөнөөр/
Н.Содномпил	Байгаль-Эрдэнэ сангийн тэргүүн /зөвшилцсөнөөр/

2.Төслийн явцад хяналт тавьж, судалгааны бат, ажлын хэстийн тайланг тухай бүр хэлэлцэн шийдвэр гаргаж байхыг удирдах зөвлөлийн дарга /Я.Адъяа/-д үүрэг болгосугай.

НАЙРАЛЬ ОРЧНЫ САЙД У.БАРСБОЛД

НИЙСЛЭЛИЙН ЗАСАГ ДАРГА БӨГӨӨД УЛААНБААТАР ХОТЫН ЗАХИРАГЧ М.ЭНХБОЛД

9.2 Minutes of Meeting No.2 on 9th March 2005



MINUTES OF MEETING
ON
THE SECOND STEERING COMMITTEE
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar City, 9th March 2005

ADIYA Yansanjav
Chairman of the Steering Committee
State Secretary,
Ministry of Nature and Environment

SHIMURA Susumu
Leader of the JICA Study Team

ZULGEREL Altai
Chairman of City Development Policy
Planning Department,
Mayor's Office

Dorjkhand T
Vice-director of Department of
Integrated Policy and Coordination of
Loan and Aids, Ministry of Finance
and Economy

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

MINUTES OF MEETING ON THE SECOND STEERING COMMITTEE (St/C) OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The meeting was proceeded according to the agenda as shown in Appendix 1. A list of officials attending the meeting is given in Appendix 2.

2. ISSUES AND DECISIONS

2.1 Various issues were discussed and clarifications on the Study were made. Subsequently appropriate consensus on the major items was reached during the meetings. These issues, clarifications and consensus are outlined as follows.

2.2 Candidates for Future Final Disposal Site

The Mongolian side concluded that following 6 sites should be the candidates for future final disposal site(s) and no more sites would be proposed.

No	Candidate Sites
1	Northern valley site of current Ulaan Chuluut disposal site
2	XMK site of former soil borrow pit for building materials
3	Southern site of current Morin Davaa disposal site
4	Bayanglin Khorkhor site in the south of Nalaikh
5	Tsagaan Davaa site located in the north of former Dari Ekh disposal site
6	Baganuur site of former coal mining pit.

Based on the decision, the study team will collect available (existing) data on the above sites for the alternative study for the formulation of master plan (M/P). In parallel to the collection of data, the Team will conduct cost study for each M/P alternative, which will be based on the location of each candidate site. The Team will prepare an alternative study report by the end of March in order for the Mongolian side to decide which site will be suitable for the future final disposal site(s).

2.3 The Procedures to select future final disposal site

The study team proposed the site selection procedure (the alternative study) as shown in the table below, in order to make it as transparent and open as possible, and to obtain public consensus on the decision of the future disposal site(s) and the M/P as much as possible.

Date	Procedure	Contents
Early Apr. 2005	Work Shop (2)	Presentation of the alternatives and discussion among TWG
Mid Apr. 2005	S/C meeting	Selection of optimum plan considering the result of discussion held in Work Shop (2)
End of Apr	Seminar (1)	Consensus on the optimum plan among various stake holders and publicity to the public

The Mongolian side agreed the procedure and will follow the schedule as shown in the table.

2.4 Pilot Project for the Improvement of the Existing Dump Site

The Mongolian side decided that the pilot project (PP) for the improvement of the existing dump site should be conducted at Ulaan Chuluut dump site (UCDS) and the site would be used after the PP until the new disposal site would be developed. And the Mongolian side requested the study team to conduct the PP as soon as possible.

The Team replied that it will convey the request to JICA headquarters.

The study team clarified the PP should be implemented under the initiative of UBC. The Team also requested the Ulaanbaatar City (UBC) that since the installation of a weigh bridge at UCDS is an important part of the PP, UBC should take necessary measures and arrangement to operate it properly if JICA approves the PP.

The UBC agreed the clarification and the request.

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Appendix 1

Agenda of the Second Steering Committee Meeting
of
the Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia

March 9, 2005 MONE, Ulaanbaatar city

No	Issues to be discussed	Speaker	Time
1	Introduction on the progress of the Study	The Secretary of the St/C Mr. Ts. Bold	5 min
2	The candidate sites for future final waste disposal system	The Secretary of the St/C Mr. Ts. Bold	5 min
3	The procedure of selection of the future final waste disposal site	The Leader of the Study Team Mr. Shimura	10 min
4	The plan of the pilot project for the improvement of Ulaan Chuluut disposal site	The Leader of the Study Team Mr. Shimura	10 min
5	Discussion of the issues submitted to the Steering Committee	Members of the St/C	30 min
6	Conclusion and decision	Members of the St/C	5 min

ATTENDANTS LIST

Mongolian side:

ADYA Yansanjav	Chairman of the Steering Committee, State Secretary of Ministry of Nature and Environment
BOLD Tsegmid	Secretary of the Steering Committee, Head of the Public Service Deparment, Governor's Office
GANKHUL Tsevelsodnom	Member of the Steering Committee, Head of the Department of Construction and Public Service Policy Adjustment, Ministry of Construction and City Development
DORJKHAND T	Member of the Steering Committee, Vice-director of Department of Policy and Coordination of Loan and Aids, Ministry of Finance
OYUNDARI Navaan-Yunden	Member of the Steering Committee, Head of Department of Strategic Planning, Policy and Coordination, Ministry of Nature and Environment
ENKHTSETSEG Shinee	Member of the Steering Committee, Officer for Environmental Social Health Affairs of the Policy Adjustment Department, Ministry of Health
ZULGEREL Altai	Member of the Steering Committee, Head of City Development Policy Planning Department
JARGALSAIKHAN Shatarkhuu	Executive Director of the Steering Committee of Apartment Owners' Unions
SHARAVDORJ Chimeddorj	President of the Union of Mongolian Ecologists

Japanese side:

SASAKI Miho	Assistant Resident Representative, JICA Mongolia Office
SHIMURA Susumu	JICA Study Team Leader
KOONO Ichiro	JICA Study Team Member
MORI Shinichi	JICA Study Team Member
KUNITSUKA Ikuko	JICA Study Team Member

9.3 Minutes of Meeting No.3 on 20th April 2005

MINUTES OF MEETINGS
ON
THE THIRD STEERING COMMITTEE
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar City, 20th April 2005

ADIYA Yansanjav
Chairman of the Steering Committee
State Secretary
Ministry of Nature and Environment

SHIMURA Susumu
Leader of the JICA Study Team

MUNKHTAYAR Gombosuren
Deputy Chairman of the Steering Committee
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

DORJKHAND Togmid
Deputy Director, Department on
Policy Coordination for Loans and
Aid, Ministry of Finance

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

MINUTES OF MEETINGS ON THE THIRD STEERING COMMITTEE (St/C) OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The meeting proceeded according to the agenda as shown in Appendix 1. A list of officials attending the meeting is given in Appendix 2.

2. ISSUES AND DECISIONS

2.1 Selection of future final disposal site was discussed and site visit was conducted by the St/C members. Subsequently appropriate consensus on the item was reached during the meeting.

2.2 Recommendation of the Second Workshop

Out of 6 candidates, the following two sites are recommended by the participants of the second workshop which was held on 11 April 2005.

No	Candidate Sites
1	Naranglin Enger site located north of Ulaan Chuluut Disposal Site
2	Tsagaan Davaa site located in the north of former Dari Ekh Disposal Site

2.3 Sanitary Landfilling at Ulaan Chuluut Disposal Site

The study team has pointed out that improvement of the current Ulaan Chuluut disposal site (UCDS) is very important in order to get consensus on the development of the new disposal site selected.

The St/C understood the importance of sanitary landfilling and the Municipality of Ulaanbaatar (MUB) confirmed to implement sanitary landfill operation once after the necessary facilities has constructed through the Pilot Project.

2.4 Detailed Environmental Impact Assessment (EIA)

Detailed impact assessment on the selected future disposal site will be conducted by the MUB and the study team will give advice when it is necessary.

2.5 Selection and Decision of Future Disposal Site

After the visit to the above two candidate sites, the St/C discussed of the issues submitted. Consequently the member of the Committee concluded that the Naranglin Enger shall be the future final disposal site for the study area.

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Appendix 1

Agenda of the Third Steering Committee Meeting
of
the Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia

April 20, 2005 MUB, Ulaanbaatar city

No.	Issues to be discussed	Speaker	Time
1	Procedure of the Site Selection	The Secretary of the St/C Mr. Ts. Bold	5 min
2	Explanation of the recommendations by the Second Workshop	The member of the Technical Working Group Mr.Delgerbayar	20 min
3	Visit to Narangiin Enger and Tsagaan Davaa Sites	Members of the St/C	2 hrs
5	Discussion of the issues submitted to the Steering Committee	Members of the St/C	20 min
6	Conclusion and decision	Members of the St/C	5 min

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Appendix 2

ATTENDANT LIST

<Mongolian Side>

Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	Deputy Chairman of the Steering Committee, General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Ms. ZULGEREL Altai	Chief of City Development, Strategic Policy and Planning Department
Mr. BOLD Tsegmid	Head of Public Service Department, Governor's Office
Mr. GALSANPUNTSAG Gombosuren	Head of the Specialized Inspection Department
Mr. BUDRAGCHAA G.	Head of the UBC Nature and Environment Department
Mr. BATSAIKHAN Ch.	Officer of City Development, Strategic Policy and Planning Department
Mr. DELGERBAYAR Badam	Officer of Public Service Department, Governor's Office
Ministry of Nature and Environment	
Ms. OYUNDARI Navaa-Yunden	Director, Department on Strategic Planning, Policy Coordination
Mr. DAGVA Sharav	Senior Officer Department on Strategic Planning, Policy Coordination
Ministry of Industry and Trade	
Mr. BAYASGALAN N.	Officer, Department on Industrial Policy and Coordination
Ministry of Health	
Ms. ENKHTSETSEG Shinee	Officer, Department on Policy Coordination
State Specialized Inspection Agency	
Ms. ARIUNZUL Yangiv	Head of Department on Inspection of Nature and Cartography
Non government organizations	
Mr. SHARAVDORJ Chimeddorj	Head of Mongolian Ecologists' Union
Mr. SODNOMPIL Namdag	Head of "Baigal Erdene" foundation

<Japanese Side>

JICA Study Team	
Mr. SHIMURA Susumu	Team Leader / Capacity Development
Mr. KONO Ichiro	Recycling System / Hazardous Waste / Pilot Project
JICA Mongolian Office	
Ms. SASAKI Miho	Assistant Resident Representative

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9.4 Minutes of Meeting No.4 on 10th May 2005

MINUTES OF MEETINGS
ON
THE FOURTH STEERING COMMITTEE
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar City, 10th May 2005

ADIYA Yansanjav
Chairman of the Steering Committee
Ministry of Nature and Environment

SHIMURA Susumu
Leader of the JICA Study Team

MUNKHBAYAR Gombosuren
Deputy Chairman of the Steering Committee
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

DORJKHAND Togmid
Deputy Director, Department on
Policy Coordination for Loans and
Aid, Ministry of Finance

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

MINUTES OF MEETINGS ON THE FOURTH STEERING COMMITTEE (St/C) OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The JICA Study Team (the Team) has submitted the following number of copies of the Interim Report (IT/R) to the Mayor's Office, Municipality of Ulaanbaatar (MUB).

Items / Kind of Report	Language	Number of Copies
1. Main Report	English	10
2. Main Report	Mongolian	40
2. Annex Report	English	10

Consequently a meeting was held on May 10 in Ulaanbaatar City to discuss the report submitted. A list of officials attending the above meetings is given in Appendix 1.

2. ISSUES AND DECISIONS

2.1 Various issues were discussed and clarifications on the Study were made. Subsequently appropriate consensus on the major items was reached during the meetings. These issues, clarifications and consensus are outlined as follows.

2.2 Policies of the Master Plan (M/P)

The Steering Committee (St/C) acknowledged the following policies of the M/P.

- Collection service will cover all the residents in the study area by 2010.
- The wastes collected will be disposed of at final disposal sites by sanitary landfill method.
- The fundamental goal of the M/P is to establish an environmentally sound SWM system in Municipality of Ulaanbaatar (MUB) by the target year of 2020.
- To achieve this goal, 3Rs (Reduce, Reuse, Recycle) will be actively promoted.
- To realize the goal, MUB will actively support the activities for Reuse and Material Recycle by the private sector.
- Among the non-reusable and non-materially recyclable wastes, papers and plastics are higher calorific materials and problematic for the sanitary landfill operation, therefore, plan for thermal recycle by the public section participation such as construction and operation of a RDF plant will be examined to recycle and process those materials.

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2.3 Projects for the Feasibility Study

The St/C agreed that Feasibility Study will be carried out for the following three projects in Phase 2 of the Study.

- Improvement of collection system including development of a central workshop.
- Development of the new Narangiin Enger disposal site (NEDS).
- Development of a recycling complex next to the NEDS.

2.4 Confirmation of IEE results and contents & schedule of EIA to be implemented according to the relevant rules and regulations

The Team confirmed the St/C on the following issues for the development of the new NEDS and a recycling complex next to the NEDS:

1. IEE and EIA are necessary for the proposed project and will be conducted according to the relevant rules and regulations by the MUB, the project proponent.
2. The first public hearing meeting with residents around the proposed NEDS shall be held before commencement of the EIA study
3. JICA study team will conduct topographic survey and soil investigation if JICA approves and provides a budget.

The St/C acknowledged the confirmation.

2.5 Proposed Pilot Projects.

The JICA Study Team proposed that the following five projects will be implemented under Phase 2 Study as pilot projects if JICA approves and provides a budget for the implementation.

- Urgent improvement of Ulaan Chuluut disposal site (UCDS)
- Thermal recycling "RDF"
- Movable recyclable collection system "Chirigami Kokan", swapping recyclables for toilet paper.
- Examination of the loading device for heavy wastes
- Raising public consciousness on waste issues.

The St/C expressed its strong wish for the pilot projects implementation and it will fully support the projects. The St/C noted that it is advisable to start the implementation of above-mentioned projects on July 2005.

2.6 Additional Studies for Phase 2 Study.

The St/C requested the following additional studies to be carried out during Phase 2

Study:

- Survey on the construction waste management to construction companies.
- Survey on hazardous waste management by factories.
- Further survey on recycling activities for the plan of recycling complex next to the NEDS.

The Team requested the St/C to enforce the selected factories to honestly reply the questionnaire to be made by the Team since the factory survey conducted in the Phase 1 is not successful due to lack of cooperation with the factories.

The St/C acknowledged the request.

The Team answered that it will covey these requests to JICA for the approval.

CONCLUSION

3.1 The St/C members who made speech during the meeting have expressed and well highlighted that the tasks undertaken by the JICA Study team on UB City SWM are being implemented on highly professional level and on due time with great efficiency.

3.1 Following the intensive and technical discussions among participants, the IT/R was fully approved by the St/C.

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Appendix 1

ATTENDANT LIST

<Mongolian Side>

Ministry of Environment	
Dr. ADIYA Yansanjav	State Secretary
Ms. OYUNDARI Navaa-Yunden	Director, Department on Strategic Planning, Policy Coordination
Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	Deputy Chairman of the Steering Committee, General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Ms. ZULGEREL Altai	Chief of City Development, Strategic Policy and Planning Department
Mr. BOLD Tsegmid	Head of Public Service Department, Governor's Office
Mr. GALSANPUNTSAG Gombosuren	Head of the Specialized Inspection Department
Mr. BUDRAGCHAA G.	Head of the UBC Nature and Environment Department
Mr. BATSAIKHAN Ch.	Officer of City Development, Strategic Policy and Planning Department
Mr. DELGERBAYAR Badam	Officer of Public Service Department, Governor's Office
Mr. JARGALSAIKHAN Shatarkhuu	Executive Director of Steering Committee of Apartment Owners' Unions
Ministry of Finance	
Mr. DORJKHAND Togmid	Deputy Director, Department on Policy Coordination for Loans and Aid
Ministry of Health	
Ms. ENKHTSETSEG Shinee	Officer, Department on Policy Coordination
State Specialized Inspection Agency	
Ms. ARIUNZUL Yangiv	Head of Department on Inspection of Nature and Cartography
Non-government organizations	
Mr. SHARAVDORJ Chimeddorj	Head of Mongolian Ecologists' Union
Mr. SODNOMPIL Namdag	Head of "Baigal Erdene" foundation

<Japanese Side>

JICA Study Team	
Mr. SHIMURA Susumu	Team Leader / Capacity Development
Mr. KONO Ichiro	Recycling System / Hazardous Waste / Pilot Project
JICA Mongolian Office	
Ms. SASAKI Miho	Assistant Resident Representative

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9.5 Minutes of Meeting No.5 on 26th October 2005

MINUTES
ON
HANDING OVER FACILITIES
FOR
URGENT IMPROVEMENT PILOT PROJECT
OF ULAAN CHULUUT DISPOSAL SITE
OF
THE STUDY ON SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY IN MONGOLIA

AGREED UPON BETWEEN

MUNICIPALITY OF ULAANBAATAR
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Ulaanbaatar City, 26th October 2005

MUNKHBAYAR Gombosuren
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

MORIMOTO Yasuhiro
Vice Resident Representative
JICA Office in Ulaanbaatar

DYONDARI Navaan-Yunden
Department of Strategic Planning
and Policy Coordination
Ministry of Nature and Environment

SHIMURA Susumu
Leader of the JICA Study Team

DORJKHAND Togmid
Deputy Director, Department on
Policy Coordination for Loans and
Aid, Ministry of Finance

MINUTES ON HANDING OVER FACILITIES FOR URGENT IMPROVEMENT PILOT PROJECT OF ULAAN CHULUUT DISPOSAL SITE OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia (hereinafter called the Study) is being conducted since November 2004 and will end March 2006. The Study consists of the following two phases.

Phase 1:	Formulation of the Master Plan (M/P) from November 2004 till May 2005
Phase 2:	Feasibility Study for Priority Projects and Implementation of Pilot Projects from June 2005 till March 2006

The second phase of the JICA study started at the end of June, 2005. During the Second phase, 5 pilot projects are implemented in order to examine the appropriateness and validity of the proposed Master Plan. One of them is "Urgent Improvement of Ulaan Chuluut Disposal Site (UCDS)". The pilot project at UCDS has three main objectives:

- To establish a control and management system of collected waste in order to avoid illegal dumping;
- To dispose of the wastes at the designated area of the UCDS. This is the first step of the sanitary landfill operation; and
- To rehabilitate completed landfill area of the UCDS and conduct a sanitary landfill operation as much as possible.

The introduction of the sanitary landfill operation could mitigate problems such as fire, odor and scattered waste, which local residents in Ulaan Chuluut have suffered from for a long time.

The Pilot Project for the Urgent Improvement of UCDS mainly consists of three elements: (1) construction of facilities required for sanitary landfill operation, (2) rehabilitation of completed landfill area, (3) improvement of landfill operation to the sanitary landfill operation. The Pilot Project is being implemented by the initiative of MUB in cooperation with JICA (study team). JICA (study team) takes responsibility on the first element while MUB takes second and third.

2. Facilities to be Handed Over to MUB

The day of October 26th, JICA (study team) officially handed over the following facilities to the MUB. The MUB declared that it received them and would pursue its responsible part of elements of the Pilot Project.

1.	Enclosing bank and perimeter drain:	1,000 meters
2.	Enclosing dam:	One unit
3.	Leachate collection facility:	One unit
4.	Leachate treatment facility:	One unit

5.	On-site road including improved access road:	1,000 meters
6.	Concrete fence:	160 meters
7.	Gate:	One unit
8.	Movable fence:	120 meters
9.	Sign board:	One unit
10.	Gas removal facility:	18 units
11.	Warm garage:	One unit
12.	Medical waste pit:	One unit

<Decisions of The Steering Committee on 26th October 2005>

DECISIONS
OF
THE STEERING COMMITTEE
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JICA STUDY TEAM

Ulaanbaatar City, 26th October 2005

MUNKHBAYAR Gombosuren
Deputy Chairman of the Steering Committee
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

SHIMURA Susumu
Leader of the JICA Study Team

OYUNDARI Navaan-Yunden
Member of the Steering Committee
Department of Strategic Planning
and Policy Coordination
Ministry of Nature and Environment

DORJKHAND Togmid
Deputy Director, Department on
Policy Coordination for Loans and
Aid, Ministry of Finance

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

DECISIONS OF THE STEERING COMMITTEE (St/C) OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The JICA Study Team (the Team) has submitted the following number of copies of the Progress Report (P/R) to the Mayor's Office, Municipality of Ulaanbaatar (MUB).

Items / Kind of Report	Language	Number of Copies
1. Progress Report	English	10
2. Progress Report	Mongolian	40

Based on the report submitted the St/C made decisions regarding the Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia on October 26. A list of officials concerned in the decisions is given in Appendix 1.

2. ISSUES AND DECISIONS

2.1 Various issues were raised and clarifications on the Study were made. Subsequently appropriate consensus on the major items was reached. These issues, clarifications and consensus are outlined as follows.

2.2 Continuation of Pilot Projects

The Team requested the St/C to take necessary measures to continue the following pilot projects, including acquisition of permission from a heating plant for the RDF combustion test:

- Urgent improvement of Ulaan Chuluut disposal site (UCDS)
- Thermal recycling "RDF"
- Movable recyclable collection system "Chirigami Kokan", swapping recyclables for toilet paper.
- Examination of the loading device for heavy wastes
- Raising public consciousness on waste issues.

The St/C replied that it will make every effort to continue it.

2.3 Necessity of Phase 3 Implementation

The St/C requested the Team to extend the study period until March 2007 in order to implement Phase 3 of the Study, which will conduct follow-up and monitor of the following projects:

1. Continuation of the following pilot projects:
   - Urgent improvement of UCDS, especially on how to conduct sanitary landfill operation as much as possible and to establish a control and management system of collected waste in order to avoid illegal dumping;
   - Thermal recycling "RDF", especially on how to collect raw materials (waste papers and plastics) and conduct second combustion test;
   - Movable recyclable collection system "Chirigami Kokan", swapping recyclables for toilet paper, especially on how to continue and expand system; and
   - Raising public consciousness on waste issues, especially on how to expand it to whole city.
2. Commencement of part of the following priority projects:
   - For the introduction of separate collection system of recyclable and non-recyclable wastes, plan and conduct of a pilot project for separate collection;
   - Plan and conduct of sorting of recyclable wastes by waste pickers at UCDS if the above pilot project will be implemented;
   - Organization and control of waste pickers;
   - Establishment of waste fund and fee collection system; and
   - Strengthening Nuuts and Duuregs, the main implementation agencies of the M/P.
3. Facilitation of implementation of the priority projects of which feasibility is studied in the Study.
4. Capacity development of the organizations concerned with SWM such as Nuuts and Duuregs, which includes training in Japan.

The Team answered that it will covey the request to JICA.

CONCLUSION

3.1 Following the intensive and technical discussions among participants, the P/R was fully approved by the St/C.

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Appendix 1

LIST OF OFFICIALS CONCERNED IN THE DECISIONS

<Mongolian Side>

Ministry of Environment	
Dr. ADIYA Yansanjav	State Secretary
Ms. OYUNDARI Navaa-Yunden	Director, Department on Strategic Planning, Policy Coordination
Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	Deputy Chairman of the Steering Committee, General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Ms. ZULGEREL Altai	Chief of City Development, Strategic Policy and Planning Department
Mr. BOLD Tsegmid	Head of Public Service Department, Governor's Office
Mr. GALSANPUNTSAG Gombosuren	Head of the Specialized Inspection Department
Mr. BATSAIKHAN Ch.	Officer of City Development, Strategic Policy and Planning Department
Mr. DELGERBAYAR Badam	Officer of Public Service Department, Governor's Office
Ministry of Finance	
Mr. DORJKHAND Togmid	Deputy Director, Department on Policy Coordination for Loans and Aid
Ministry of Health	
Ms. ENKHTSETSEG Shinee	Officer, Department on Policy Coordination

<Japanese Side>

JICA Study Team	
Mr. SHIMURA Susumu	Team Leader / Capacity Development
Mr. KANI Keiko	Community Participation / Social Consideration
Mr. MORI Shinichi	Finance and Management Analysis
Mr. TAKAHASHI Masahiko	Coordinator
JICA Mongolian Office	
Ms. SASAKI Miho	Assistant Resident Representative

9.6 Minutes of Meeting No.6 on 21st February 2006

DECISIONS
OF
THE PROGRESS REPORT (2)
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JICA STUDY TEAM

Ulaanbaatar City, 21st February 2006

MUNKHBAYAR Gombosuren
Deputy Chairman of the Steering Committee
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

Ichiro KONO
Member of the JICA Study Team

OYUNDARI Navaan-Yunden
Director of Department of Strategic Planning
and Policy Coordination
Ministry of Nature and Environment

DORJKHAND Togmid
Deputy Director, Department on
Policy Coordination for loans and
Aid, Ministry of Finance

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

DECISIONS OF MEETINGS OF THE PROGRESS REPORT (2) OF THE STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The JICA Study Team (the JICA ST) has submitted the following number of copies of the Progress Report (P/R) (2) to the Mayor's Office, Municipality of Ulaanbaatar (MUB).

Items / Kind of Report	Language	Number of Copies
1. Progress Report (2)	English	10
2. Progress Report (2)	Mongolian	40

Based on the report submitted, the St/C made decisions regarding the Study on Solid Waste Management Plan for Ulaanbaatar City in Mongolia on February 21. A list of officials concerned in the decisions is given in Appendix 1.

2. ISSUES AND DECISIONS

2.1 Various issues were raised and clarifications on the Study were made. Subsequently appropriate consensus on the major items was reached. These issues, clarifications and consensus are outlined as follows.

2.2 Contents of Phase 3 Study

The JICA ST explained the proposed contents of the Phase 3 Study and clarified that implementation of them is subject to the JICA approval.

The St/C acknowledged the proposed contents which are described in the P/R (2), and requested following pilot projects to be implemented during phase 3.

As for the Continuation and Monitoring of the Pilot Projects

- Urgent Improvement of UCDS: to examine the effectiveness of buffer zone by tree planting

As for the Expansion of the Pilot Projects: 3Rs Promotion

- Public education for the introduction of discharged rules and separate collection.
- Introduction of separate collection
- Sorting operation of separated recyclables wastes at UCDS including construction of sorting yard and fair trade building with organization of waste pickers.
- Production of RDF at UCDS using residues from the sorting operation
- More than one week mixed combustion test of RDF with coal.

The JICA ST answered that it will covey the request to JICA.

CONCLUSION

3.1 Following the intensive and technical discussions among participants, the P/R (2) was approved by the St/C.

2

Appendix 1

LIST OF OFFICIALS CONCERNED IN THE DECISION

<Mongolian Side>

Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	Deputy Chairman of the Steering Committee, General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Ms. ZULGEREL Altai	Chief of City Development, Strategic Policy and Planning Division
Mr. BOLD Tsegmid	Head of Public Service Division, Governor's Office
Mr. G. GALSANPUNTSAG	Head of City Specialized Inspection Agency
Mr. BATSAIKHAN Chultemsuren	Officer of City Development, Strategic Policy and Planning Department
Mr. DELGERBAYAR Badam	Officer of Public Service Department, Governor's Office
Ministry of Environment	
Ms. OYUNDARI Navaan-Yunden	Director, Department on Strategic Planning, Policy Coordination
Ministry of Finance	
Mr. DORJKHAND Togmid	Deputy Director, Department on Policy Coordination for Loans and Aid
Ministry of Health	
Ms. G. ENKHJARGAL	Officer, Department on Policy Coordination

<Japanese Side>

JICA Study Team	
Mr. KONO Ichiro	Recycling System/Hazardous Waste/Pilot Project
Mr. SUZUKI Tamotsu	SWM Facility Planning/Environmental Consideration
Mr. TAKASHO Takuya	Coordinator
JICA Mongolian Office	
Ms. SASAKI Miho	Assistant Resident Representative

9.7 Minutes of Meeting No.7 on 12th January 2007/02/27

DECISIONS OF THE STEERING COMMITTEE
ON
THE DRAFT FINAL REPORT
OF
THE STUDY
ON
SOLID WASTE MANAGEMENT PLAN
FOR
ULAANBAATAR CITY
IN
MONGOLIA

AGREED UPON BETWEEN

STEERING COMMITTEE
AND
JICA STUDY TEAM

Ulaanbaatar City, 12th January 2007

MUNKHBAYAR Gombosuren
Deputy Chairman of the Steering Committee
General Manager of Ulaanbaatar City
and Chairman of the Governor's Office

SHIMURA Susumu
Leader of the JICA Study Team

BANZRAGCH Tsesee
Member of the Steering Committee
Director of Environment and Natural Resources Department
Ministry of Nature and Environment

DORJKHAND Togmid
Deputy Director, Department on Policy Coordination for Loans and Aid, Ministry of Finance

Witnessed by

SASAKI Miho
Japan International Cooperation Agency

DECISIONS OF THE STEERING COMMITTEE (St/C) ON THE DRAFT FINAL REPORT OF STUDY ON SOLID WASTE MANAGEMENT PLAN FOR ULAANBAATAR CITY IN MONGOLIA

1. INTRODUCTION

The JICA Study Team (the Team) has submitted the following number of copies of the Draft Final Report (DF/R) to the Mayor's Office, Municipality of Ulaanbaatar (MUB).

Items / Kind of Report	Language	Number of Copies
1. Summery Report	English	20
2. Summery Report	Mongolian	40
3. Main Report	English	10
4. Main Report	Mongolian	40
5. Annex Report	English	10
6. Annex Report	Mongolian	20
7. Data Book	English	10
8. Data Book	Mongolian	20

Based on the report submitted the Steering Committee (St/C) made decisions regarding the Study on Solid Waste Management Plan for Ulaanbaatar City (UBC) in Mongolia on January 12, 2007. A list of officials concerned in the decisions is given in Appendix 1.

2. ISSUES AND DECISIONS

2.1 Various issues were raised and clarifications on the Report were made. Subsequently appropriate consensus on the major items was reached. These issues, clarifications and consensus are outlined as follows.

2.2 Preparation of a Report on Incineration

The St/C requested the Team to make a report that examines a feasibility of the introduction of an incineration system in UBC including estimation of construction and operation & maintenance cost, and benefit from generation of power and warm water. Because there are some arguments why RDF is proposed instead of an incinerator.

The Team replied that it will prepare the report and present in the Final Report.

2.3 Comments on the D/FR

The Study Team requested the St/C that all comments by the Mongolian side to the

Draft Final Report (DF/R) should be given to the JICA Ulaanbaatar Office by February 10, 2007 if they are to be considered by the Team for the preparation of the Final Report.

The St/C approved the request.

3. CONCLUSION

3.1 Following the intensive and technical discussions among participants, the DF/R was fully approved by the St/C.

Appendix 1

LIST OF OFFICIALS CONCERNED IN THE DECISION

<Mongolian Side>

Ulaanbaatar City Government	
Mr. MUNKHBAYAR Gombosuren	Deputy Chairman of the Steering Committee, General Manager of Ulaanbaatar City and Chairman of the Governor's Office
Mr. B.MUNKHBAATAR	Chief of City Development Policy Planning Division
Mr. BOLD Tsegmid	Head of City Maintenance Public Utilities Agency
Mr. G. GALSANPUNTSAG	Head of City Specialized Inspection Agency
Mr. BATSAIKHAN Chultemsuren.	Officer of City Development Policy Planning Division
Mr. DELGERBAYAR Badam	Director of SWM, City Maintenance Public Utilities Agency
Ministry of Environment	
Mr. BANZRAGCH Tsesed	Director, Environment and Natural Resources Department
Ministry of Finance	
Mr. DORJKHAND Togmid	Deputy Director, Department on Policy Coordination for Loans and Aid
Ministry of Health	
Ms. G. ENKHJARGAL	Officer, Department on Policy Coordination

<Japanese Side>

JICA Study Team	
Mr. SHIMURA Susumu	Recycling System/Hazardous Waste/Pilot Project
Mr. SUZUKI Tamotsu	SWM Facility Planning/Environmental Consideration
JICA Mongolian Office	
Ms. SASAKI Miho	Assistant Resident Representative