6 Environmental and Social Consideration

6 Environmental and Social Consideration

6.1 Environmental and Social Consideration System and Organization in Mongolia

6.1.1 Laws and Regulations for Environmental and Social Consideration in Mongolia

Laws and Standards related to environmental and social consideration are listed as follows.

Table 6.1.1 Laws and Standards for Environmental and Social Consideration

Field	Laws and Standards	Year
General	Law on Environmental Protection	1995 Amended total 12 times including 2005/ 2006/ 2008/ 2010
Environmental Impact Assessment	Law on Environmental Impact Assessment	1998, Amended in 2001, 2006 and 2012
	Guidelines on Method of Natural Environmental Impact Assessment	2010
	Regulations and Guidelines on Preparation of Natural Environmental Protection Plan, Environmental Management and Monitoring Plan, and Rehabilitation Plan	2006
	Regulations and Guidelines on Method of Detailed Natural Environmental Impact Assessment	2000
Air	Law on Air	1995 Amended in 2010 and 2012
Water	Law on Water	1995, 2004, 2012
Protection Area	Law on Special Protected Areas	1994 Amended for 7 times including 1997/ 2002/ 2003/ 2004/ 2006/ 2008
Ecology	Law on Natural Plants	1995 Amended in1997/ 2002/ 2010
	Law on Forests	1995 Amended in 2012
Land	Law on Land	(1994) Amended for 10 times including 2002/ 2003/ 2004/ 2005/ 2009/ 2010
	Law on Land Privatization	2002 Amended in 2005, 2008 and 2011

Field	Laws and Standards	Year
Waste	Law on Solid Waste	2003 Amended in 2012
Others	Law on Protection from Toxic Chemicals	1995
Standards	MNS 0017-0-0-06: Environmental protection standard system.	2000
	MNS 0017-5-1-13: Rehabilitation of destroyed lands. Terminology and determination	1979
	MNS 0017-5-1-18: Rehabilitation. Classification of disturbed lands	1993
	MNS 0017-5-1-19: General requirements for rehabilitation of disturbed lands	1983
	MNS 3473: Environment. Land. Land use. Terminology and determination	1992
	MNS 4191: Environmental protection standard system. Climate of Mongolia. Main parameters	1983
	MNS (ISO) 4226: Air quality. General subject and general requirements	1993
	MNS 4585: Air quality parameters. General requirements	1998 Amended in 2005 and 2007
	MNS 17-2-0-07: Environmental protection. Air emissions. Classification	1979
	MNS: 0017-2-3-16: Air. Rules of air quality monitoring of city and settlements	1998
	MNS 4586: Indicator of water environment quality. General requirements	1998
	MNS (ISO) 4867: Water quality. Sampling third part. Recommendation for storage and protection	1999
	MNS 3342: General requirements for protection of groundwater	1982
	MNS 0900: Drinking water. Hygienic requirements and quality control	1992 Amended in 2005
	MNS 4943: Water quality. Effluent standard.	2000
	MNS 3297: Soil. Volume of hygienic parameters of soil of city and settlements	1991
	MNS 4917: Environment. Requirements for determination of the fertile soil layer standard for disposal while performing earth-moving activities	2000
	MNS 5850: Soil quality. Soil pollutants elements and substances	2008
	MNS 4990: Workplace atmospheres. Hygienic requirement.	2000
	MNS 5803: Occupational safety and health. General requirements for lead content in workplace air and the workplace.	2007

Source: JICA Study Team

The Mongolian Law on Environmental Protection, which is the basic law of environmental protection and management, was established in 1995 and amended 12 times. The law briefly addresses on Environmental Impact Assessment (EIA). The details of EIA is written in the Mongolian Law on Environmental Impact Assessment (EIA law), which was established in 1998 and amended in May, 2012.

Three items of "Strategic Environmental Assessment (SEA)," "Environmental Baseline Assessment" and "Cumulative Impact Assessment" were introduced in addition to the "Environmental Impact Assessment" through the revision in May 2012. Strategic assessments shall be carried out by a professional entity licensed by the Ministry of Nature, Environment and Green Development and the entity will make a report. The report shall first be discussed by the Technical Board and then presented to the government by the cabinet member responsible for nature and environment. Although the EIA law has been revised, related guidelines are not yet revised as of November 2012. The Technical Board was not held and procedures under the previous EIA law continue. Because SEA shall be applied for wide area projects which stretch over several provinces, the Ministry of Nature, Environment and Green Development determines that SEA is not applicable to the Metro project. An "Environmental baseline assessment" shall be carried out before EIA and the contents of "cumulative impact assessment" shall be investigated during SEA. Since concepts and details of them are not yet clear, information on new or revised guidelines needs to be gathered.

EIA in Mongolia shall be implemented by the two steps of "General Environmental Impact Assessment (GEIA)" as a screening procedure and "Detailed Environmental Impact Assessment (DEIA)". The Metro project is categorized as a target project which needs to undergo GEIA by the Ministry of Nature, Environment and Green Development before land possession and land use license application by the implementation body.

At screening stage, projects are categorized into three based on screening criteria: (1) implementation proposal of project is remanded and rejected, because of following reasons. Proposed technology, implement method and activities have high possibility of negative impacts, land use is not reflected in the land management plan, or the project does not comply with the policy, strategic assessment result, and related laws and regulations, (2) project is to be implemented without DEIA under certain conditions, and (3) project requires DEIA conduct. The projects with the conditions of the category which apply to the DEIA (category 3) are the cases with large negative impacts that affect people's health and environment, or cases in which impact cannot be predicted. It will require further detailed study as it develops and uses large amount of natural resources. The Metro project will fall on the category with which DEIA is required by the Ministry of Nature, Environment and Green Development. DEIA implementation can only be carried out by the companies which are designated by the Ministry of Nature, Environment and Green Development to perform such. The outline of the revised EIA law is shown in Table 6.1.2.

At present, related laws do not mention treatment of resettlement and land acquisition.

Table 6.1.2 Summary of Mongolian EIA Law

Assessments of Environmental Impact (Article 4)	1. Assessments of environmental impact shall include the following: Strategic environmental assessment (SEA) Environmental baseline assessment Environmental impact assessment (EIA) Cumulative impact assessment 2. Technical Board with responsibilities to regulate issues that may arise in connection with environmental impact assessment; review of assessments and reports based on SEA; cumulative impact assessment and EIA shall work at the Ministry of Nature, Environment and Green Development. Technical Board Member shall be appointed by the Ministry of Nature, Environment and Green Development.
Environmental Baseline Assessment and Cumulative Impact Assessment (Article 6)	1. The project implementer is responsible for commissioning the environmental baseline assessment to identify potential impacts of the project. 2. The project implementer shall ensure that the environmental baseline assessment is performed with the due participation of a licensed professional entity or research institution and, if necessary, shall seek guidance from the Ministry of Nature, Environment and Green Development. 3. The Ministry of Nature, Environment and Green Development shall conduct the assessment to analyze the effects on the specific regions and basins from various projects implemented by individuals and business entities with due inputs from a licensed professional entity. 4. If deemed necessary, the cabinet member in charge of nature and environment may appoint a team of experts for conducting the assessment. 5. The costs associated with the cumulative impact assessment shall be borne by the project implementers according to its range of impacts. 6. The professional licensed entity shall submit for review the environmental baseline assessment report and cumulative impact assessment report to the Technical Board at the Ministry of Nature, Environment and Green Development.
Environmental Impact Assessments (Article 7)	1. An environmental impact assessment shall consist of a general environmental impact assessment (GEIA) and detailed environmental impact assessment (DEIA). 2. Applications for a license for the use of natural resources, extraction of petroleum and minerals, and possession and use of land for business purposes and an approval for any other projects are subject to screening. 3. The project implementer shall apply for a GEIA to the Ministry of Nature, Environment and Green Development, the Aimag or Ulaanbaatar city governor's office, whichever is applicable according to the classification, by submitting a brief description of the project, a feasibility study (F/S), the engineering design and drawings, baseline description of the proposed project environment, written opinions of the relevant Soum and district governor and other related documents. 4. The screening shall be performed by an assessment expert who shall complete the assessment within 14 working days and issue a formal opinion as to whether: (1) The project should be rejected on the grounds that it is likely to cause considerable harm to the environment by virtue of its proposed technology, technique and activities; that it lacks land management planning; that its activities are inconsistent with the state policy, strategic assessment results or relevant legislation; (2) The project may be implemented without a DEIA subject to specific conditions; (3) The project requires DEIA.

	If deemed necessary, the time period specified above may be extended once by a further 14 days.
Detailed Environmental Impact Assessment (Article 8)	1. The result of the screening shall define the objectives, areas, scope and duration of the work for the DEIA. 2. The DEIA shall be conducted by a Mongolian entity authorized to do so. 3. The entity authorized to conduct the DEIA shall prepare a report presenting the findings of the DEIA and develop an environmental management plan. 4. The DEIA Report shall include the following: (1) The baseline data and indicators of the environment in which the project is proposed to be implemented; (2) Estimations and findings of studies that are conducted to identify a potential and the major negative impact of the project and establish their magnitude, spatial extent and consequences; (3) Recommendations for measures to mitigate and eliminate potential as well as the major impact of the project; (4) Recommendations for alternative methods and technology that may potentially reduce the pollution level expected from the proposed project and for environmental considered method and technology; (5) Risk assessment of impacts of the proposed project on human health and the environment (if the general environmental impact assessment requires so doing) ; (6) Objectives, scope and indicators of the environmental management plan; (7) Notes of consultations made with local authorities and communities likely to be affected by the proposed project; and (8) Other issues pertaining to the cultural stratum and special nature of the project. 5. The project implementer shall be officially asked to comment on the DEIA report. 6. The project implementer shall bear the costs associated with the conduct of the detailed environmental impact assessment. 7. The entity that has conducted the DEIA shall keep the original copy of the data and information collected in the field and findings of the investigation carried out by the assessment specialist. It shall prepare a DEIA report in four copies, one of which is to be submitted to the Ministry of Nature, Environment and Green Development, another to the project implementer, and third to the Aimag, Soum or district governments having jurisdiction over the proposed project. The entity shall retain the remaining copy.
Environmental Management Plan (Article 9)	1. An environmental management plan shall form an integral part of the DEIA. 2. The entity that has performed the DEIA shall develop an environmental management plan in order to protect and ensure sustainable use and conservation of the nature and environment in which the proposed project is to be implemented, ensure the realization of recommendations outlined in the SEA, mitigate, eliminate and prevent adverse impacts that are identified by the detailed impact assessment, and monitor and identify potential negative consequences that may arise in the proposed project environment. 3. The Ministry of Nature, Environment and Green Development shall approve the environmental management plan for the proposed project and grant the permit to go ahead with the project. 4. An environmental management plan shall consist of an environmental protection plan and environmental monitoring program. 5. The environmental protection plan shall address measures to mitigate and eliminate adverse impacts identified during the EIA and provide for the timeframe and estimated budget for implementation of those measures. 6. The environmental monitoring program shall address the monitoring and analysis of changes made to the state of the environment as a result of the

	project activity and shall clarify reporting requirements and ways to implement the plan as well as providing the timeline and estimated budget.
Appraisal of DEIA (Article 10)	1. The licensed entity having completed the DEIA shall submit the DEIA report and related documents to the entity that performed the screening within the period specified. 2. The expert who has received the report on the DEIA shall appraise the quality of the assessment and issue an opinion within 18 working days. (The chief assessment expert of the Ministry of Nature, Environment and Green Development may extend the appraisal period once by 18 days.) The chief assessment expert of the Ministry of Nature, Environment and Green Development may exclusively appoint a team of experts to do an appraisal of the assessment report. 3. The Ministry of Nature, Environment and Green Development shall decide whether the project should go ahead based on the DEIA report and the opinions of the expert and the Technical Board that have appraised the quality of the report. 4. The DEIA report shall be advertised and presented by the project implementer and the professional entity having performed the assessment to the communities likely to be affected by the project.

Source: Made by JICA Study Team on Japanese Translation of EIA

6.1.2 Difference from JICA's Guideline for Environmental and Social Considerations

The EIA law of Mongolia was developed based upon the guidelines of donors and does not differ largely from the "Guidelines for Environmental and Social Considerations" by JICA. The Revised EIA law in May 2012 includes SEA and descriptions on stakeholders and public participation. However, the target of Mongolian EIA law is the physical environment, and social considerations and Resettlement Action Plan (RAP) are not stated. Even if land resettlement occurs, the necessity of preparation of RAP is not regulated at present in the other laws. The draft Land Acquisition Law of Mongolia is being drawn up at present; constitution period of which is not yet clarified.

The UB Metro project and its related facilities are categorized as in the Guidelines for Environmental and Social Considerations by JICA issued in April 2010. The project will implement underground construction and sufficient considerations on possible negative effects when necessary. Possible negative effects are related to topographical and geological features such as land subsidence, air pollution, noise/vibration and accidents noise/vibration during construction and after the Metro operations begin. This project will be defined at the GEIA stage as a case where negative effects to human health and natural environment are expected to be large or impossible to estimate, detailed investigation is necessary, or huge amount of natural resources need to be developed through the project implementation; and therefore a DEIA will be applied to conduct.

The implementation of the project is assumed and the EIA is usually conducted immediately

before the project implementation. Prediction and analysis on negative effects in each evaluation item seems not emphasized. Environmental monitoring is regulated in article No.9, EIA law. Implementation report which is mentioned in next year plan needs to be submitted every December of the year.

Stakeholder meeting is described in article 18, EIA law in Mongolia, which is stipulated in the JICA Guidelines, but it is not emphasized. Also, the public notice of the report to be done within 30 days to acquire public comment is shorter than its period stated in the JICA Guidelines.

6.1.3 Roles of Related Authorities

The related authorities to EIA are as in Table 6.1.3 and the Study Team made interviews to them on related information.

Table 6.1.3 Related Authorities

Organization	Authorized Tasks
Ministry of Nature, Environment and Green Development	Approval of EIA
Implementation and Coordination Bureau of Railways and Maritime Transportation Policy, Ministry of Road and Transportation	One of the windows of the project and the candidates for counterpart of project and EIA implementer
Public Transportation Department of Ulaanbaatar City	The department is responsible for public transportation in Ulaanbaatar city and one of the windows to the Metro project and the candidates for counterpart of project and EIA implementer. They were in charge of implementation and management of the former F/S by Korean Metro.
Capital City Master Plan Department of Ulaanbaatar City (name of Construction, Urban Development and Planning Department of Ulaanbaatar City was changed and part of the functions of Land Authority of Ulaanbaatar City simultaneously was absorbed under the new government after election in 2012)	The department is in charge of management of application for construction and one of the windows to the Metro project and the candidates for counterpart of project and EIA implementer.
Environmental Pollution Department of Ulaanbaatar City	The authority is in charge of collection and compilation of general information on environment and present status of air, water and soil pollutions of Ulaanbaatar city
Property Related Department of Ulaanbaatar City (part of function of Land Authority of Ulaanbaatar City as absorbed under new government)	The authority is in charge of land register and permits and license on land in Ulaanbaatar city.
Upper Surface and Groundwater Authority of Ulaanbaatar City	In charge of water and sewer services

Source: JICA Study Team

6.2 Basic Environmental and Social Conditions

6.2.1 Environmental Standards

(1) Air Quality

Air quality standard is defined in MNS 4585. It was originally prepared in 1998, and then updated in 2007. Its outdoor air quality standard is shown in Table 6.2.1.

Most of the standard values are the same as the minimum value among World Health Organization (WHO), Japan, European Union (EU) and International Finance Corporation (IFC) standards. Only the standard values for PM_{10} and $PM_{2.5}$ are equal to or a little bit more than the maximum value among WHO, Japan, EU and IFC standards.

Table 6.2.1 Air Quality Standard（MNS 4585:2007）

Pollutant	Averaging Time	Unit	Mongol[1]	WHO[2]	IFC[3]	Japan[4]	EU[5]
Sulfur dioxide (SO_2)	10-minute	micro g/m^3	500	500	500	-	-
	20-minute	micro g/m^3	450	-	-	-	-
	1-hour	micro g/m^3	-	-	-	285	350
	24-hour	micro g/m^3	20	20	20	114	125
	1-year	micro g/m^3	10	-	-	-	-
Carbon monoxide (CO)	30-minute	micro g/m^3	60,000	-	-	-	-
	1-hour	micro g/m^3	30,000	-	-	-	-
	8-hour	micro g/m^3	10,000	-	-	25,000	10,000
	24-hour	micro g/m^3	-	-	-	12,500	-
Nitrogen dioxide (NO_2)	20-minute	micro g/m^3	85	-	-	-	-
	1-hour	micro g/m^3	-	200	200	-	200
	24-hour	micro g/m^3	40	-	-	123	-
	1-year	micro g/m^3	30	40	40	-	40
Ozone (O_3)	8-hour	micro g/m^3	100	100	100	129	120
Total suspended matter (TSP)	30-minute	micro g/m^3	500	-	-	-	-
	24-hour	micro g/m^3	150	-	-	-	-
	1-year	micro g/m^3	100	-	-	-	-
Particulate matter (PM_{10})	1-hour	micro g/m^3	-	-	-	200	-
	24-hour	micro g/m^3	100	50	50	100	50
	1-year	micro g/m^3	50	20	20	-	40
Fine particulate matter ($PM_{2.5}$)	24-hour	micro g/m^3	50	25	25	35	-
	1-year	micro g/m^3	25	10	10	15	25
Lead (Pb)	24-hour	micro g/m^3	1	-	-	-	-
	1-year	micro g/m^3	0.5	-	-	-	0.5
Benzo (a) pyrene ($C_{20}H_{12}$)	24-hour	micro g/m^3	0.001	-	-	-	-

Source 1: MNS 4585:2007 (http://www.estandard.mn/filebase/files/4585-2007.pdf)
2: WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Global update 2005 (http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf)
3: IFC Environmental, Health, and Safety Guidelines, April 30, 2007 (http://www1.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES)
4: Website of Ministry of Environment, Japan (Japanese, http://www.env.go.jp/kijun/taiki.html)
It should be noted that Japanese Ox standards is shown as O_3 standard here, and SPM (Suspended Particulate Matter) is shown in PM_{10} rows. Although these are not exactly the same scientifically, they are nearly the same conventionally. Standard values in ppm units are converted into micro g/m^3.
5: Website of EU (English, http://ec.europa.eu/environment/air/quality/standards.htm)

(2) Water Quality

The drinking water quality standard is shown in Table 6.2.2. Water quality standard is shown in Table 6.2.3. Effluent standard into surface water is shown in Table 6.2.4 and effluent standard into ground soil in Table 6.2.5. Water standard is not decided by water area. While IFC has international effluent standard for treated sewage[1], Mongolia does not have a unified effluent standard.

Table 6.2.2 Drinking Water Quality Standard

	Natural Chemical Substance	Unit	Standard Value
1	Molybdenum (Mo)	mg/l	0.07
2	Barium (Ba)	mg/l	0.7
3	Boron (B)	mg/l	0.5
4	Copper (Cu)	mg/l	1.0
5	Calcium ion (Ca^{2+})	mg/l	100.0
6	Magnesium ion(Mg^{2+})	mg/l	30.0
7	Manganese (Mn)	mg/l	0.1
8	Sodium (Na)	mg/l	200.0
9	Phosphate ion (PO_4^{3-})	mg/l	3.5
10	Fluorine (F)	mg/l	0.7-1.5
11	Hydrogen ion concentration (pH)	mg/l	6.5-8.5
12	Selenium (Se)	mg/l	0.01
13	Strontium (Sr)	mg/l	2.0
14	Sulfate ion(SO_4^{2-})	mg/l	500.0
15	Hardness	mg-equ/m^3	7.0
16	Chlorine ion (Cl)	mg/l	350.0
17	Arsenic (As)	mg/l	0.01
18	Hydrogen sulfide (H_2S)	mg/l	0.1
19	Chromium (Cr)	mg/l	0.05
20	Total residue	mg/l	1000.0
21	Uranium (U)	mg/l	0.015

Source: MNS 0900:2005 (http://www.estandard.mn/file.php?sid=1302)

Table 6.2.3 Water Quality Standard

	Substance	Unit	Permissible Limits
1	pH		6,5-8,5
2	Dissolved oxygen (DO)	mg-O/l	6 (warm period) 4 (Non-warm period)
3	BOD_5	mg-O/l	3
4	COD_{Mn}	mg-O/l	10
5	NH_4-N	mg-N/l	0.5
6	NO_2-N	mg-N/l	0.02
7	NO_3-N	mg-N/l	9.0
8	PO_4-P	mg-P/l	0,1

[1] pH 6 – 9 pH, BOD 30 mg/l, COD 125 mg/l, Total nitrogen 10 mg/l, Total phosphorus 2 mg/l, Oil and grease 10 mg/l, Total suspended solids 50 mg/l, Total coliform bacteria = Most Probable Number 400/100 ml

	Substance	Unit	Permissible Limits
9	Chlorine（Cl）	mg/l	300
10	Fluorine (F)	mg/l	1.5
11	Sulfate ion(SO_4^{2-})	mg/l	100
12	Manganese (Mn)	mg/l	0.1
13	Nickel (Ni)	mg/l	0.01
14	Copper (Cu)	mg/l	0.01
15	Molybdenum (Mo)	mg/l	0.25
16	Cadmium (Cd)	mg/l	0.005
17	Cobalt (Co)	mg/l	0.01
18	Lead (Pb)	mg/l	0.01
19	Arsenic (As)	mg/l	0.01
20	Total Chromium (Cr)	mg/l	0.05
21	Chromium hexavalent (Cr^{6+})	mg/l	0.01
22	Zinc (Zn)	mg/l	0.01
23	Mercury (Hg)	µg/l	0.1
24	Mineral oils	mg/l	0.05
25	Phenol	mg/l	0.001
26	Detergents	mg/l	0.1
27	Benzo (a) pyrene	mkg/l	0.005

Source: MNS 4586-1998

Table 6.2.4 Effluent Standard into Surface Water

	Substance	Unit	Permissible Limits
1	Temperature	^{o}C	20
2	pH		6-9
3	BOD	mg-O/l	20
4	COD	mg-O/l	50
5	Permanganate oxidation	mg-O/l	20
6	Particulate matter	mg/l	35
7	Dissolved salt	mg/l	800
8	Cyanide	mg/l	0.05
9	Phenol	mg/l	0.05
10	Mineral oil	mg/l	1
11	Fats	mg/l	5
12	Sulfide	mg/l	0.2
13	Copper (Cu)	mg/l	0.3
14	Cadmium (Cd)	mg/l	0.03
15	Manganese (Mn)	mg/l	0.5
16	Mercury (Hg)	mg/l	0.001
17	Antimony (Sb)	mg/l	0.05
18	Nickel (Ni)	mg/l	0.2
19	Selenium (Se)	mg/l	0.02
20	Iron (Fe)	mg/l	1
21	Lead (Pb)	mg/l	0.1
22	Total Chromium (Cr)	mg/l	0.3
23	Chromium hexavalent (Cr^{6+})	mg/l	0.05
24	Zinc (Zn)	mg/l	1
25	Ammonium (NH_3)	mg/l	8
26	Total nitrogen (N)	mg/l	20
27	Total phosporus (P)	mg/l	1.5
28	Residual chloride	mg/l	1.5
29	Trichloroethylene	mg/l	0.2
30	Tetrachloroethylene	mg/l	0.1
31	Phosphorus organic compounds	mg/l	0.2

Source: MNS 4943-2000

Table 6.2.5 Effluent Standard into Ground-Soil

	Substance	Unit	Permissible Limits
1	Temperature	^{o}C	20
2	Odor		Odor not smelled
3	pH		6-9
4	BOD	mg-O/l	50
5	COD	mg-O/l	100
6	Permanganate oxidation	mg-O/l	30
7	Particulate matter	mg/l	150
8	Dissolved salt	mg/l	1.000
9	Cyanide	mg/l	0.2
10	Mineral oil	mg/l	3
11	Fats	mg/l	10
12	Sulfide	mg/l	0.5
13	Copper (Cu)	mg/l	0.5
14	Cadmium (Cd)	mg/l	0.05
15	Manganese (Mn)	mg/l	1
16	Mercury (Hg)	mg/l	0.001
17	Antimony (Sb)	mg/l	0.1
18	Nickel (Ni)	mg/l	0.5
19	Selenium (Se)	mg/l	0.02
20	Iron (Fe)	mg/l	2
21	Lead (Pb)	mg/l	0.5
22	Total Chromium (Cr)	mg/l	0.5
23	Chromium hexavalent (Cr^{6+})	mg/l	0.1
24	Zinc (Zn)	mg/l	2
25	Ammonium (NH_3)	mg/l	15
26	Total nitrogen (N)	mg/l	30
27	Total phosporus (P)	mg/l	5

Source: MNS 4943-2000

(3) Soil Pollution

Environmental quality standard for soil pollution is shown in Table 6.2.6.

Table 6.2.6 Environmental Quality Standard for Soil Pollution（mg/kg）

	Substance	Soil Type			Standard Value
		Sand	Loam	Clay	
1	Lead (Pb)	100	70	50	100
2	Cadmium (Cd)	3	1.5	1	3
3	Mercury (Hg)	2.0	1.0	0.5	2
4	Arsenic (As)	6	4	2	6
5	Total Chromium (Cr)	150	100	60	150
6	Chromium hexavalent (Cr^{6+})	4	3	2	4
7	Tin (Sn)	50	40	30	50
8	Strontium (Sc)	800	700	600	800
9	Vanadium (V)	150	130	100	150
10	Copper (Cu)	100	80	60	100
11	Nickel (Ni)	150	100	60	150
12	Cobalt (Co)	50	40	30	50
13	Zinc (Zn)	300	150	100	300
14	Molybdenum (Mo)	5	3	2	5
15	Selenium (Se)	10	8	6	10
16	Boron (B)	25	20	15	25
17	Fluorine (F)	200	150	100	200
18	Cyanide	25	15	10	25

Source : MNS 5850:2008 (http://www.estandard.mn/file.php?sid=1302)

(4) Noise and Vibration

Environmental quality standard for noise is shown in Table 6.2.7. On the other hand, Environmental quality standard for vibration does not exist.

Table 6.2.7 Environmental Quality Standard for Noise

Mongolia MNS 4585:2007[1]	Daytime (from 7am to 11pm)	16 hour average	dB	60
	Nighttime (from 11pm to 7am)	8 hour average	dB	45
IFC[2]	Daytime (from 7am to 10pm) Residential area Industrial area and commercial area	15 hour average	dB	 55 70
	Nighttime (from 10pm to 7am) Residential area Industrial area and commercial area	9 hour average	dB	 45 70

Source 1 http://www.estandard.mn/filebase/files/4585-2007.pdf
2 IFC Environmental, Health, and Safety Guidelines, April 30, 2007 (http://www1.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES)

6.2.2 Current Environment

(1) Air Quality

Air pollution in UB city is identified as one of the most priority issues by the national government as well as UB city. This report focuses on air quality around the target area of the

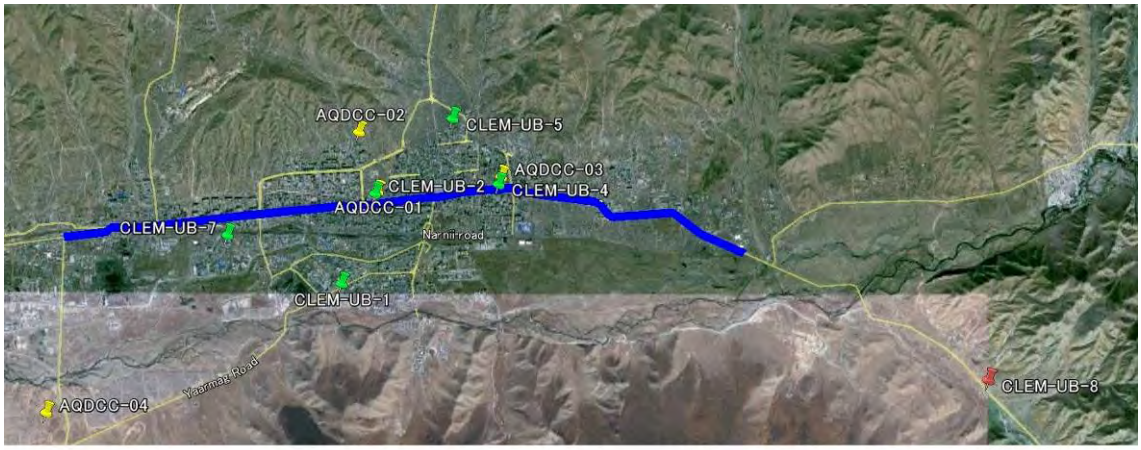
Metro plan, although other air quality reports generally focus on ger areas.

【Air Quality Monitoring】

National and city organizations measure ambient air quality in Ulaanbaatar city; each organization sets up ambient air quality monitoring stations. The National organization, The Central Laboratory of Environment and Metrology (CLEM), started air quality monitoring from 1977 through a 24-hour manual sampling. After updating the monitoring system for several times, CLEM installed hourly monitoring system at six stations newly established in 2010 and started hourly monitoring. Additionally, CLEM monitors air quality at some other locations, using hourly monitoring system on a trailer.

The Air Quality Department of Capital City (AQDCC) installed HORIBA-brand hourly monitoring system at four stations. Additionally, AQDCC also monitors air quality at some other locations, using hourly monitoring system on a track.

Location of these ten stations is shown in Figure 6.2.1.



Source: JICA Study Team, based on field survey

Figure 6.2.1 Location of Continuous Air Quality Monitoring Stations using Hourly Monitoring System

Air quality of UB is summarized based on hourly average data of six station of CLEM for one year (from Oct. 2010 to Sep. 2011).

Table 6.2.8 shows six stations' characteristics, in the viewpoint of distance from major air pollutant sources (except high emission sources, such as Power Plant). CLEM-02 and CLEM-04 are very near from the underground section of the Metro plan. CLEM-07 is nearest from the non-underground section of the Metro plan, but located in industrial zone.

Table 6.2.8 Distance from Major Air Pollutant Sources to Monitoring Stations (m)

Monitoring Station	Ger Area	Major Road	Metro Plan	Industrial Area
CLEM-01	1,500	1,600	2,200	0
CLEM-02	150	20	20	1,000
CLEM-04	800	130	120	3,000
CLEM-05	10	400	1,700	3,500
CLEM-07	1,300	700	700	0
CLEM-08	800	11,000	7,800	7,000

Note: "Major Road" is defined as "6 or more lanes roads" here, in view points of air pollutant emissions expected.

Source: JICA Study Team, based on field survey

【Air Quality Compared with Air Quality Standard "MNS 4585:2007"】

One year average standard is defined for SO_2, NO_2, PM_{10} and $PM_{2.5}$. Annual average is calculated for each station and pollutant, and then compared with air quality standard, as shown in Table 6.2.9. Ratio of available data count compared with expected data count is shown in Table 6.2.10.

All the stations and pollutants are over than air quality standard. Annual average at CLEM-02, which is the nearest from the Metro line, is 3.1 to 6.2 times higher than air quality standards. Annual average at CLEM-04, which is the second nearest from the Metro line, is 1.2 to 2.4 times higher than air quality standards, although air quality monitoring at CLEM-04 was not successful to monitor in winter. If air quality data at CLEM-04 in winter is available, the annual averages of CLEM-04 would be much higher than the values shown in Table 6.2.9.

Table 6.2.9 Air Quality (Yearly Average) compared with Standard

		MNS 4585 : 2007	CLEM -01	CLEM -02	CLEM -04	CLEM -05	CLEM -07	CLEM -08
SO_2	micro g/m^3	10	26	31	12	53	20	18
NO_2	micro g/m^3	30	40	93	49	42	37	31
PM_{10}	micro g/m^3	50	152	189	120	355	209	86
$PM_{2.5}$	micro g/m^3	25	-	154	49	-	-	-

Source: JICA Study Team, calculated with data supplied by National Agency for Meteorology and Environment Monitoring (NAMEM)

Table 6.2.10 Share of Available Data Count compared with Expected Data Count

	CLEM-01	CLEM-02	CLEM-04	CLEM-05	CLEM-07	CLEM-08
SO_2	40%	90%	45%	97%	88%	90%
NO_2	46%	88%	46%	98%	75%	80%
PM_{10}	47%	80%	17%	92%	66%	89%
$PM_{2.5}$		92%	45%			

Source: JICA Study Team, calculated with data supplied by (NAMEM)

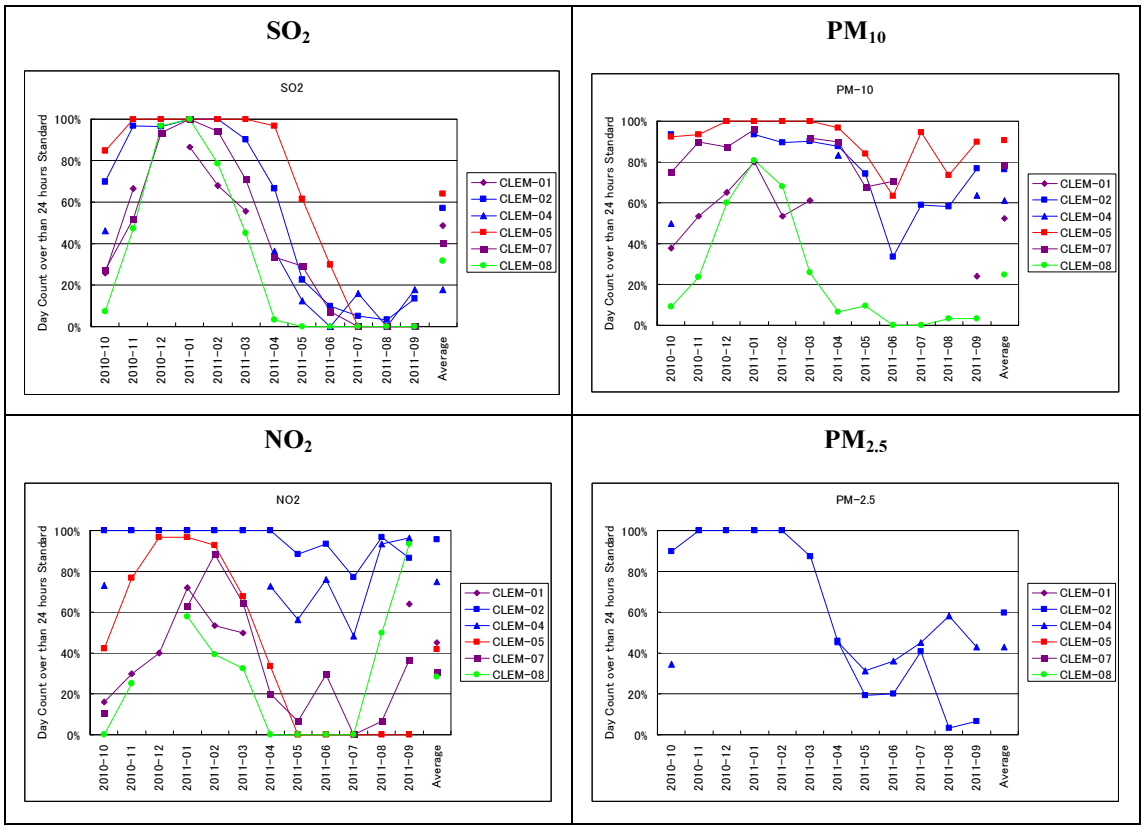
24 hour average standard is defined for SO_2, NO_2, PM10 and $PM_{2.5}$. Daily average is calculated for each day, station and pollutant, and then compared with respective 24 hour average standards. Figure 6.2.2 shows monthly ratio of day count over than 24 hour standard.

SO_2 level is generally higher than standard in winter at all the stations, and less than standard in summer. CLEM-05, which is located next to ger area, is most polluted in terms of the "24-hour average over than standard" count per day.

In summer season, NO_2 level is generally lower than standard at CLEM-05 (next to ger area), and higher than standard at CLEM-02 and CLEM-04 (next to Peace Avenue). CLEM-02, which is located next to Peace Avenue, is most polluted in terms of the "24-hour average over standard" count per day.

PM_{10} level is generally higher than standard even in summer. CLEM-05, which is located next to ger area, is the most polluted in terms of the number of days when the level of PM_{10} is higher than its 24-hour-average standard.

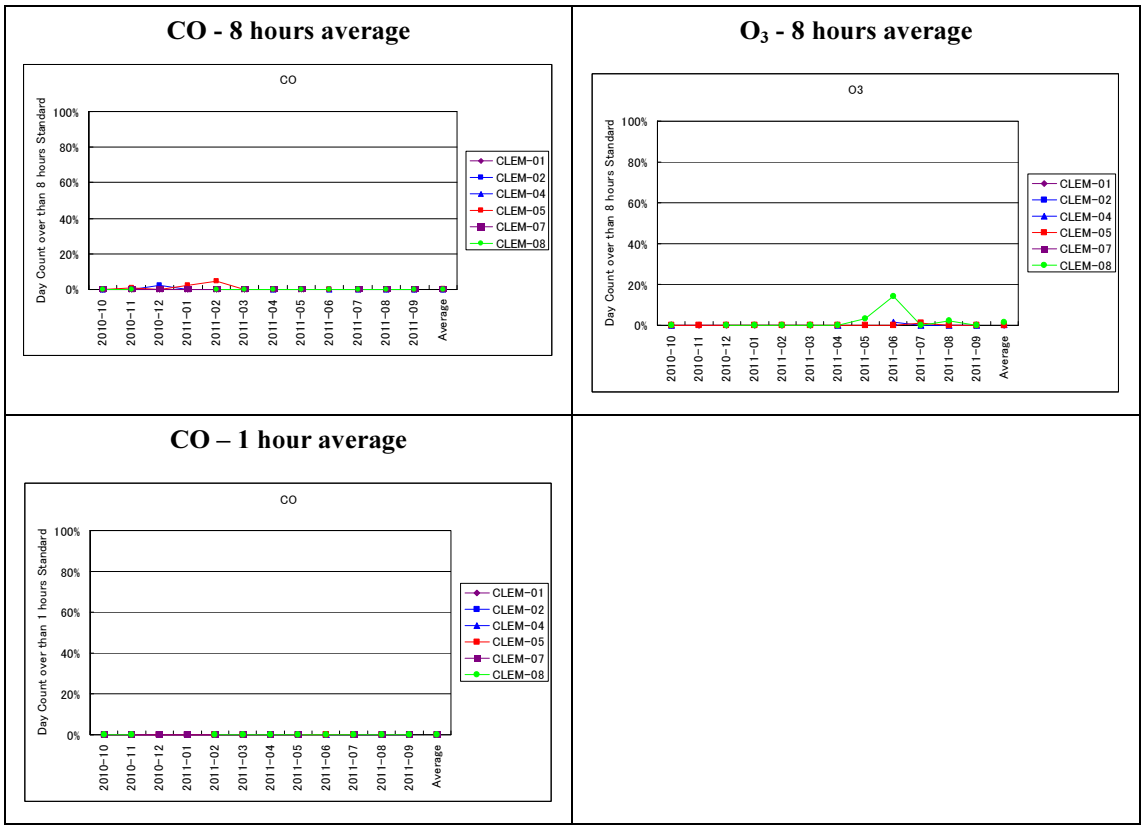
$PM_{2.5}$ is measured at CLEM-02 and CLEM-04 only. Both are near from Peace Avenue. $PM_{2.5}$ is generally higher than standard even in summer.



Source: JICA Study Team, calculated with data supplied by NAMEM

Figure 6.2.2 Monthly Ratio of Day Count over 24 Hour Standard

One or eight hour average standard is defined for CO and O_3. Hourly and eight hour average is calculated for each hour (or every eight hours), station and pollutant, and then compared with air quality standards respectively. Figure 6.2.3 shows ratio over the standard. O_3 was higher than standard at CLEM-08 (at Khonkhor, which is out of build-up area of Ulaanbaatar) for 14% in June, 2010. Air quality was generally lower than the standard for all the other stations, pollutants and average time.



Source: JICA Study Team, calculated with data supplied by NAMEM

Figure 6.2.3 Ratio of Hours over 1 and 8 Hour Standard

【Air Quality Compared with Air Temperature】

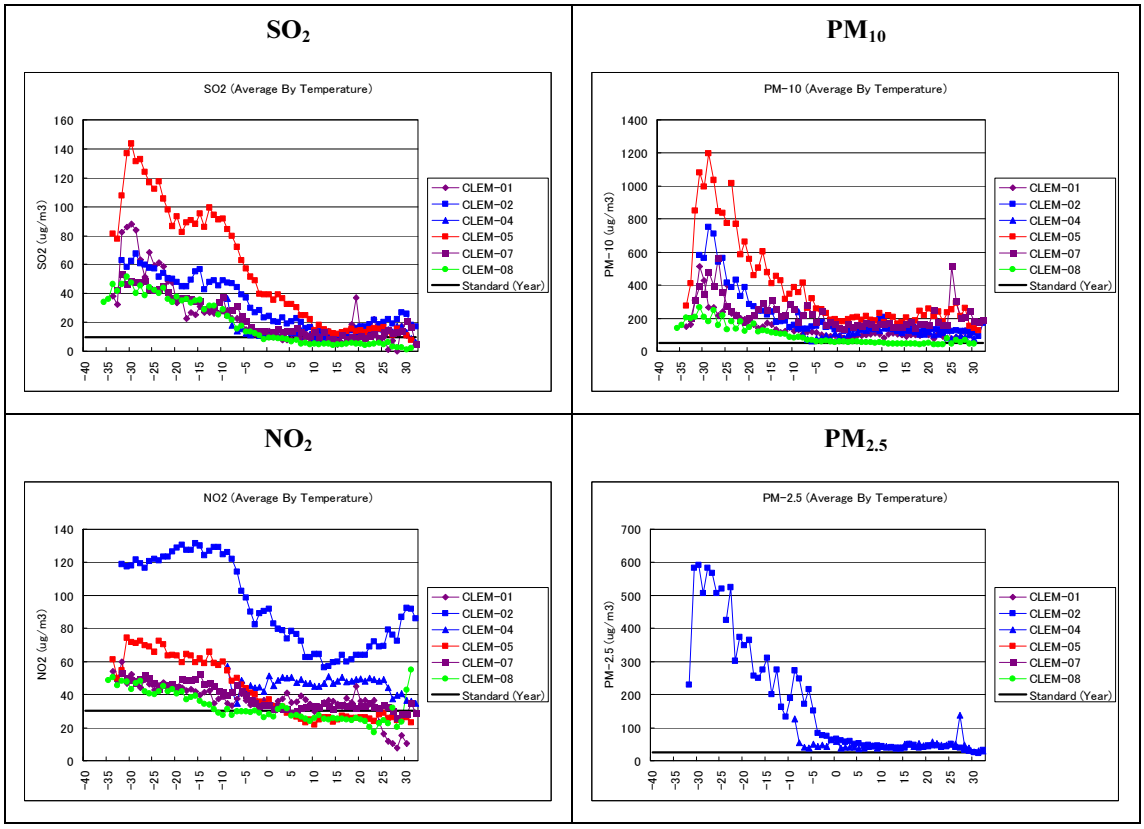
Figure 6.2.4 shows air quality average by temperature. At roadside stations (CLEM-02 and CLEM-04), SO_2, PM_{10} and $PM_{2.5}$ are lower in -5 or more temperature, compared with -5 or less temperature. NO_2 is not much lower even in -5 or more temperature.

【Summary on Air Quality】

- The levels of SO_2, NO_2, PM_{10} and $PM_{2.5}$ are generally higher than air quality standard.
- The levels of CO and O_3 are generally under the air quality standard.
- The level of SO_2 is higher than the air quality standard, especially in winter, near ger area. The level of NO_2 is over the air quality standard whole around a year at stations along major roads. PM_{10} and $PM_{2.5}$ is also over the standard.
- Sulfur content of diesel oil is very high[2]. Most of the large autobuses emission specification is higher than the Japanese and EU standard. As a result, pollutants

[2] Sulfur content of diesel oil must be less than 5,000 ppm, according to MNS 216-2006. Sulfur content of diesel oil measured by "Capacity Development Project for Air Pollution Control in Ulaanbaatar City, Mongolia" (AQDCC & JICA, 2011) was 1,400 ppm.

from vehicles are very high, especially NOx, and this causes high NO_2 concentration along major roads. It is important to reduce emission from vehicles, especially NOx.



Source: JICA Study Team, calculated with data supplied by NAMEM

Figure 6.2.4 Air Quality Average by Temperature

(2) Water Quality

Deterioration of the quality of water in Ulaanbaatar has been a serious issue. At Tuul River, due especially to treatment water from the central wastewater treatment plant, the water quality of downstream from Songino Bridge, located lower than the influent points, is poor[3]. Most of the companies in Ulaanbaatar emit their wastewater without any treatment, which exacerbates the problem. For groundwater pollution management, although there is a standard (MNS 3342:1982) which prohibits any activity that may pollute groundwater and defines pollution prevention rules for ground drilling, groundwater may be polluted by untreated waste water from ger areas and by sewage water from damaged pipes. The World Bank reported that these water issues caused heath problem and resulted as 10,000 people contracting diarrhea yearly throughout Mongolia and 70% of them are in Ulaanbaatar[4].

[3] Environmental Outlook 2010 (Ulaanbaatar City, 20011)

[4] Mongolia Environment Monitor 2004 (World Bank)

(3) Soil Pollution

Soil pollution has been an issue in Ulaanbaatar, although in many items, the levels are still lower than the standards. The major causes of soil pollution are vehicle exhausts; chemical substances created from waste burning; and illegal dumped waste. In addition, wastewater from gasoline stations, car repairing shops, leather factories and printing farms is another. Soil pollution is checked at 99 points in the city, and the data proved that soil pollution has been getting worse year by year, values of many measurement items are lower than the soil standard.

The average amount of lead (Pb) contained in soil has increased from 30mg/kg in 1995, 36mg/kg in 1999, and 45.7mg/kg in 2006[5] to 57mg/kg in 2010. The main reason is gasoline increased along with the remarkable increase of vehicles. At the intersection of State Pedagogical University, which records the highest value of traveling volume among the major intersections of the city, the amount of Pb was 116.8mg/kg and higher than the standard. The average amount of Pb in some intersections on Peace Avenue was 63.4mg/kg and higher than the average of the city.

In Mongolia, leaded gasoline has been prohibited from 2006 based on MNS217:2006. In Russia and China, the major countries from which Mongolia imports, leaded gasoline was prohibited even before 2006. Since 2007, leaded gasoline has not been found present from the data to analyze gasoline contents[6]. Currently it seems that leaded gasoline is not imported and lead in soil has not increased as similar as before.

The average amount of Cr which was 66mg/kg has been increased. The major causes are general waste and chemical substances from leather factory wastes. Moreover, vehicle exhaust is another source. The average amount of Cr along Peace Avenue was 130.8mg/kg, and the amount at intersections of Central Post Office, State Pedagogical University, and West Intersection was higher than the standard.

Table 6.2.11 Average Soil Content of Heavy Metal in Ulaanbaatar City (mg/kg)

	As	Cd	Hg	Pb	Cr	Cu	Zn	Fe
Average (UB2010)	7.46	1.56	0.094	57	66	92	135	2021
Max	28.58	5.00	0.450	2413	657	793	478	6925
Min	1.83	0.60	0.025	2	8	10	27	890
N	66	63	59	115	115	111	111	111
MNS 58:50	6	3	2	100	150	100	300	
UB 2008			0.138	55	64	51	79	

Source: Environment Report 2010, 2011, Ulaanbaatar

[5] Environmental Outlook of the Ulaanbaatar City, 2008, UNEP
[6] Russian certificates attached to gasoline importing custom declaration document, and laboratory analysis report by Capacity Development Project for Air Pollution Control in Ulaanbaatar City Mongolia, JICA, 2010

Table 6.2.12 Average Soil Content of Heavy Metal at Major Intersections (mg/kg)

No.	Locations		Pb	Cd	Cr	Sr
1a	East Intersection	South of the road	18.2	0.16	120.1	305.7
1b		North of the road	77.9	2.32	127.7	240.8
2a	State Pedagogical University	South of the road	116.8	0.78	165.2	546.5
2b		North of the road	26.0	0.05	105.1	361.2
3a	Central Post Office	South of the road	64.9	1.09	106.6	370.5
3b		North of the road	90.9	2.60	166.7	740.4
4a	West Intersection	South of the road	84.4	1.50	165.2	518.8
4b		North of the road	28.6	2.20	90.1	213.1
	Average		63.4	1.3	130.8	412.1
	Standard		100.0	3	150	800
	Ulaanbaatar Average (2005)		43.7	1.9	90.5	375.1

Source: Environmental Outlook of the Ulaanbaatar City, 2008, UNEP

(4) Noise and Vibration

The JICA Study Team coordinated a noise and vibration study to ascertain current noise and vibration conditions along the planned route. The field survey was conducted from September 5th until September 14th, 2012, at 10 points shown in Figure 6.2.5. Noise and vibration were measured in both peak and lowest load traffic hours.

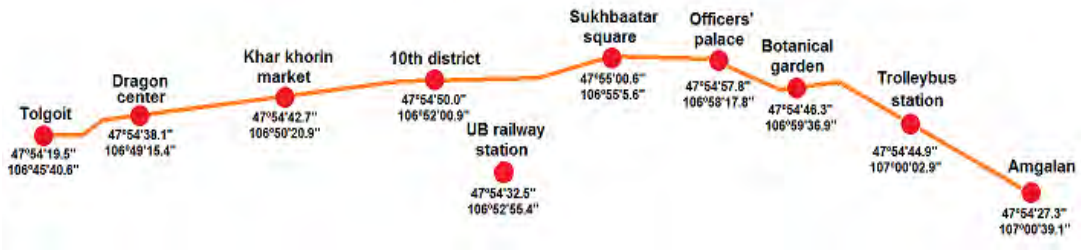


Figure 6.2.5 Locations of Noise and Vibration Monitoring

Table 6.2.13 shows the data measures. Ambient noise levels throughout the city center are higher than Mongolian standards. During peak hours the noise level is higher than the standard by 18% (MNS 4585:2007, Day time standard from 7 a.m. to 23 p.m. is 60dB), and the nighttime is higher by 29% (Nighttime standard from 23 p.m. to 7 a.m. is 45 dB). As for vibration, there is no standard regulation and the vibration is very low.

Table 6.2.13 Summary of Noise and Vibration Monitoring

Measuring points	Noise (dB)						Vibration (dB)			
	Peak Traffic Hours			Lowest Load Traffic Hours			Peak Traffic Hours			Lowest Load Traffic Hours
	Max	Min	Average	Max	Min	Average	Max	Min	Average	
Tolgoit	81	64	73.6	58	47	51.8	42	40	41	<38
Dragon Center	79	70	74.8	66	51	55.4	41	39	40	<38
Khar khorin Market	73	68	70.6	80	53	61.4	51	44	46.2	<38
10th District	74	65	70.0	64	51	55.2	41	39	40	<38
UB Railway Station	74	62	67.2	62	53	57	50	39	43.5	<38
Sukhbaatar Square	77	68	72	66	57	62.8	43	40	41.3	<38
Officers' Palace	76	64	70	58	53	56	42	39	40.5	<38
Botanical Garden	75	68	71.8	74	59	65.2	42	39	40.5	<38
Trolleybus Station	75	64	69	66	52	58.6	41	39	40.3	<38
Amgalan	78	55	69.2	65	52	57.2	45	45	45	<38
Average			70.8			58.1			41.8	

Source: JICA Study Team

(5) Land Subsidence

A Land subsidence survey has not been conducted yet.

(6) Unpleasant Odour

A Survey on unpleasant odours has not yet been conducted.

(7) Protection Area

1) Special Protected Areas

Based on the Law on Special Protected Areas (1994), Bayanzurkh Mountain Locally Protected Area which is decided by Ulaanbaatar City is located in the east of the city. Further east, Gorkhi-Terelji National Park is located. In the south of the city, the other side of Tuul River, Bogd Khaan Mountain Strictly Protected Area is located.

Source: Preparatory Survey (Basic Design) on the Ulaanbaatar Water Supply Development Project in Gachuurt in Mongolia, March 2010, JICA

Figure 6.2.6 Natural Protected Areas around Ulaanbaatar City

2) Water Resource Protected Areas

Water resource must be environmentally protected based on the Law on Water which was established in 1995 and amended in 2004 and 2012.

For water resource protection, water quality, and ecological protection, water areas are categorized special and normal protected zones, and sanitary zones. Special protected zones are at least within 50m from the edge of water including rivers and alluvial zones along with riverside (riverbed). Inside the zone, construction building and facility, agriculture, collection of plant, tree and soil are prohibited. Normal protected zones are within 200m from water resource areas. Sanitary zones are within 100m from water supply areas including water resource areas, wells and water supply facilities. Based on the water law revised in May 2012, the Ministry of Nature, Environment and Green Development shall determine the activity to control and is preparing it in the guideline at present.

The Metro plan area, Amgalan station, which is the nearest location of the Tuul river, located approximately 500m from edge of the river, and 200m from central water intake zone, is not a protected area. However, some rivers across the Metro route, especially the treatment of ground structure needs to be confirmed.

(8) Fauna and Flora: endangered or rare species

The Metro plan site is located in the urban area, so there are no endangered or rare species which need to be paid special attentions for protection.

(9) Hydrology

1) Precipitation

The average amount of annual rainfall has been 206.3mm since 2003. The highest rainfall was 288.0mm in 2003 and the lowest rainfall was 185.7mm in 2007. Seasonally, the rainfall from June to August is high. The average rainfall during the season in the last ten years is equal to approximately 70% of annual total rainfall.

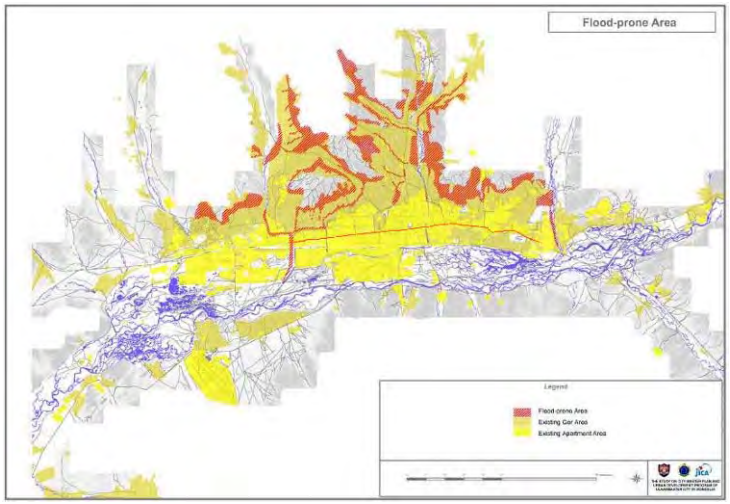
Table 6.2.14 Annual Rainfall over the Last Ten Years (from 2003 to 2012) (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2003	1.4	6.2	1.3	3.3	51.4	22.3	75.3	46.3	51.6	2.9	19.2	6.8	288.0
2004	2.3	8.9	7.0	16.5	25.6	85.8	48.6	16.8	34.6	3.5	5.6	5.5	260.7
2005	4.4	4.6	4.8	10.5	13.6	24.4	59.9	41.8	23.9	1.5	1.7	2.2	193.3
2006	5.1	1.1	3.5	5.6	70.1	26.3	86.4	26.2	18.4	10.2	3.1	1.8	257.8
2007	4.4	6.7	11.5	4.5	18.6	23.2	35.5	72.6	0.8	1.8	2.1	4.0	185.7
2008	2.2	0.9	2.3	1.4	12.4	67.2	69.1	41.3	14.0	10.8	0.7	6.2	228.5
2009	0.9	2.8	3.8	2.0	39.0	31.1	118.0	47.3	13.8	8.1	1.8	5.5	274.1
2010	2.3	4.4	7.2	1.1	25.7	23.3	79.6	65.8	8.9	12.6	7.6	1.2	239.7
2011	1.4	8.2	0.4	11.0	27.4	77.3	58.3	43.9	7.6	10.5	11.7	2.1	259.8
2012	0.7	1.4	0.9	6.5	9.0	70.1	106.8	56.7	17.5	3.8	7.8	6.2	287.4

Source: NAMEM

2) River

There are four main rivers flowing through the city. Tuul River flows in the south part of the city from east to west. Selbe, Uliastai and Tolgoit rivers flow from the mountains in the northern part of the city to Tuul River. The Metro project site which runs in parallel to Tuul River also intersects with some of these rivers. Usually, the volume of river water is not high, but in the case of a large amount of rainfall, this becomes flood hazard areas (See Figure 6.2.7). The Metro plan is parallel to Tuul River and across some rivers listed above.



Source: UBMPS, 2009, JICA

Figure 6.2.7 Flood Hazardous Areas

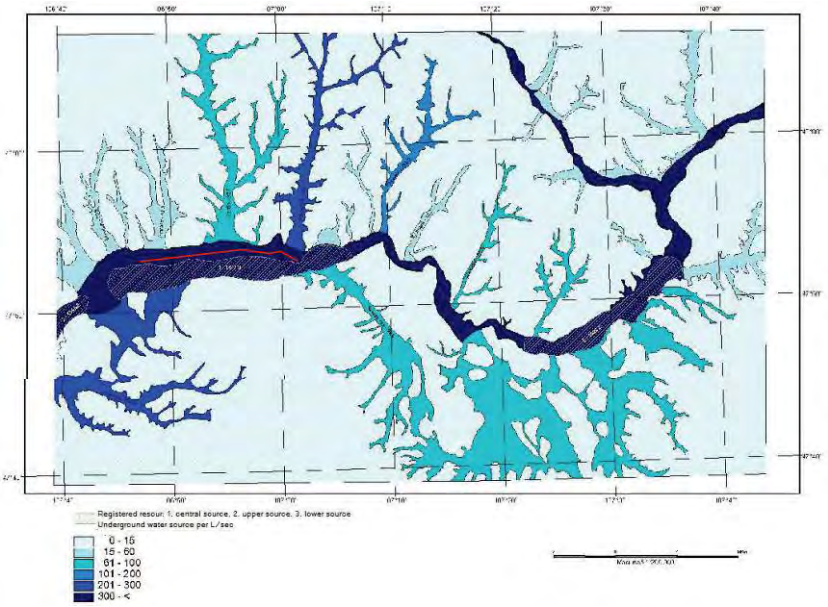
3) Groundwater

Figure 6.2.8 shows groundwater resources around the planned Metro. Groundwater and related geological information is stated as follows:

- The ground is mainly composed of gravel and sand. Sand rock is found from Sukhbaatar Square to the East Intersection. Sandstone bed at the East Intersection is located 2m in depth.

- A groundwater level is located from 0.8 to 8.4 m in depth.
- Groundwater of 3~4 m depth is frozen during cold season.

Ground of the planned area does not include silt and clay fraction much, so it is judged that formation layer for impermeable layer does not exist. In the boring survey results implemented by F/S of the Ulaanbaatar Metro by Korea, permeability coefficient by permeability test is approximately 10^{-2} (see Table 6.2.15). Therefore, groundwater vein is expected to be not affected by shield tunnel approximately 7m in diameter at 17m below the ground. Also, Ground subsidence by groundwater pumping is not expected along the planned line since no soft clay layer has been found. However, since the area is rich in groundwater, tunnel construction may affect groundwater resources. Groundwater resources must be assessed by surveys. Also, based on boring results, appropriate selection of construction method for unchanged groundwater level is necessary.

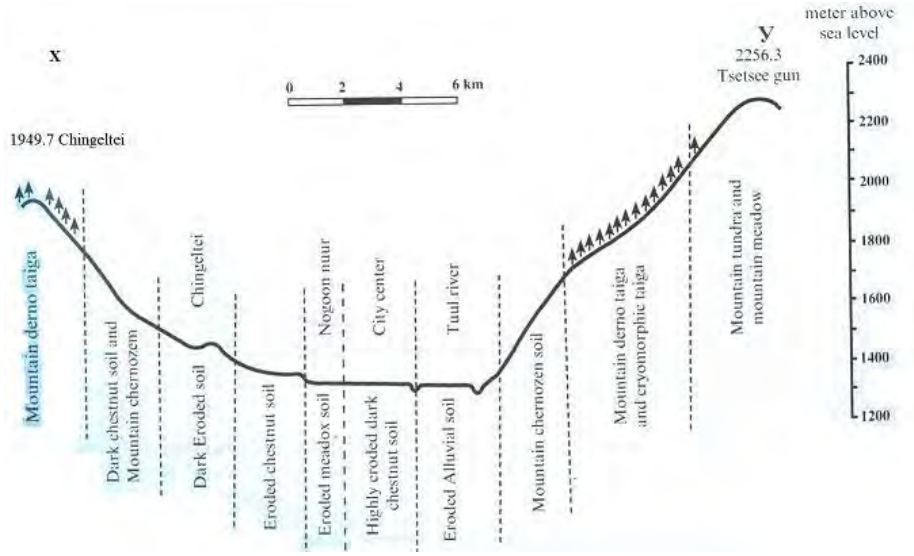


Source: Environmental Outlook of the Ulaanbaatar City 2007, 2008, UNEP

Figure 6.2.8 Groundwater

(10) Topological and Geological Features

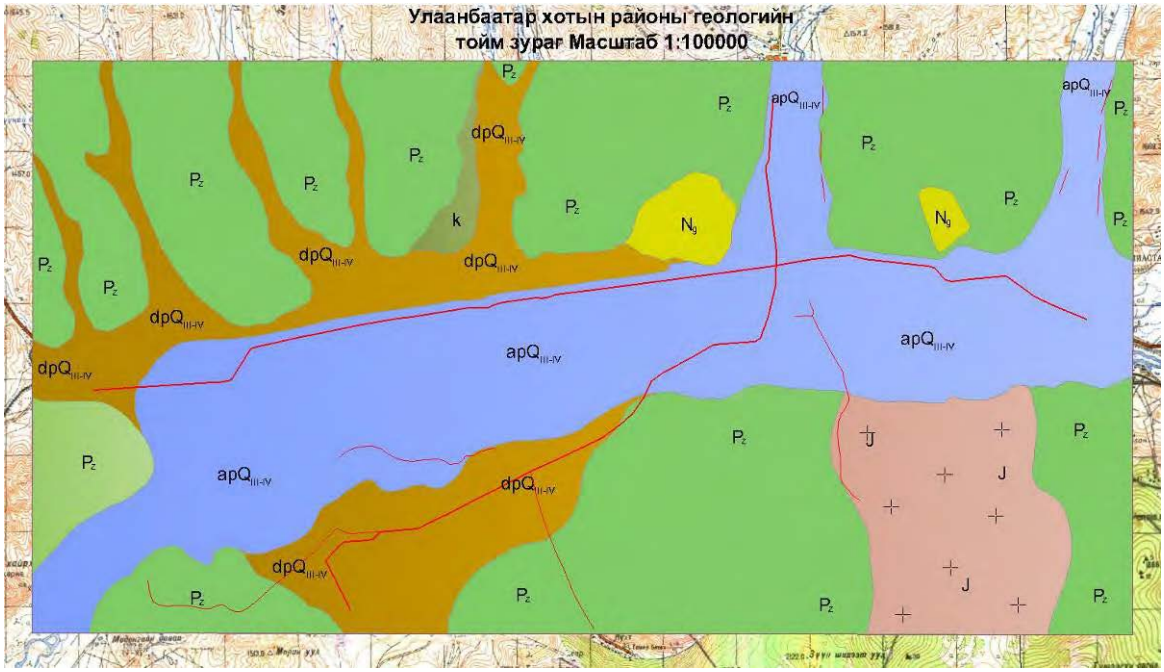
The Ulaanbaatar city center is a basin surrounded by mountains. It is located in the Khentii geosynclinals structure within the Northern Mongolia's sinuous system. Topographic and ground surface characteristics cross to the Metro planned line is shown in Figure 6.2.9.

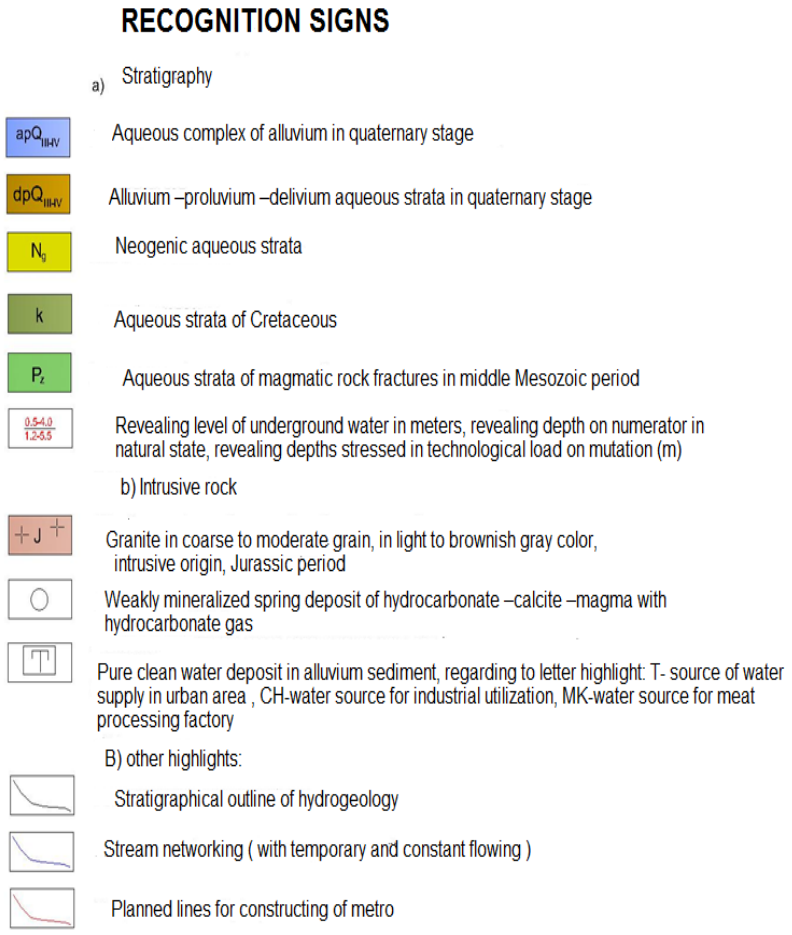


Source: Environmental Outlook of the Ulaanbaatar City 2007, 2008, UNEP

Figure 6.2.9 Cross Section of Ulaanbaatar City between South and North

Geological features of the Metro planned area are mainly composed of gravel and sand of quaternary period alluvium origin (see Figure 6.2.10).

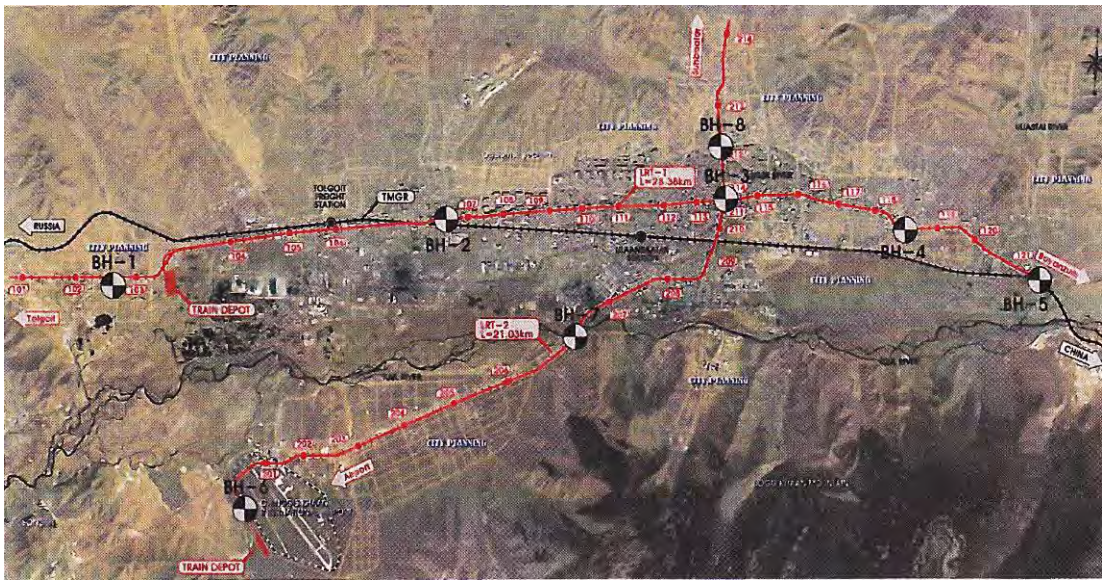




Source: Metro F/S Survey Result Report of Ulaanbaatar City

Figure 6.2.10 Geology Map

Overview of geological features in the Metro planned route based on the boring survey by Ulaanbaatar Metro F/S by Korea is shown (see Table 6.2.15). Survey locations are shown in Figure 6.2.11. The Metro survey target route from east to west including the boring points is 5 points. Based on the data, the area of ground has poorly graded gravel; sedimentary layer that mainly includes clayey sand or silty clayey sand, rock appears below the layer. That is, the ratio of silt and clay is not high. The height of rocks located at the bottom layer varies by location; there is high in central area in the vicinity of Sukhbaatar Square. As for the aquifer, it appears from 2.4 to 3.0m below ground level in the shallow place.



Source: Metro F/S Survey Result Report of Ulaanbaatar City

Figure 6.2.11 Boring Location Map

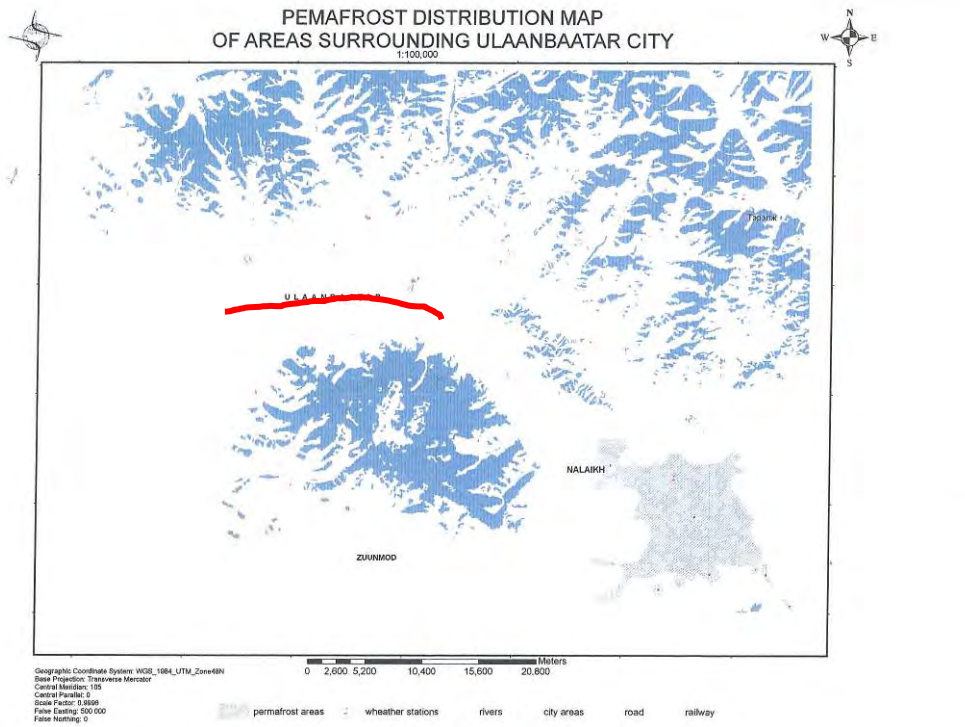
Table 6.2.15 Geological Feature Data along UB Metro Planned Route

Hole No.	Stratum	Depth (m)	Thickness (m)	Soil composition	Grain size analysis (%)			N value	Freezing depth (m)	Aquifer depth (m)	Coefficient of Permeability (cm/sec)
					Gravel	Sand	Silt/Clay				
BH-1	Deposited	0.00 – 5.50	5.50	Poorly graded gravel with sand (GP)	52.1	43.1	4.8	28/30	3.59	1st: 2.4	5.8 x 10-2 - 8.1 x 10-2
		5.50 – 11.2	5.70	Poorly graded gravel with sand and silt (GP – GM)	50.0	43.9	6.1	23/30		2nd: 6.8	2.3 x 10-2 - 3.5 x 10-2
		11.2 – 14.5	3.30	Poorly graded gravel with sand and clay (GP – GC)	62.6	26.0	11.4	24/30			1.2 x 10-3 - 1.2 x 10-2
		14.5 – 16.9	2.40	Poorly graded gravel with sand and silt (GP – GM)	48.9	44.4	6.7	-		3rd: 14.5	
		16.9 – 18.0	1.10	Clayey sand with gravel (SC)							
		18.0 – 30.5	12.5	Poorly graded gravel with sand and silt (GP – GM)	48.8	43.6	7.6	24/30-26/30		4th: 18.0	
		30.5 – 46.9	15.4	Clayey sand with gravel (SC)	26.1	53.4	20.5	36/30-40/30			1.2 x 10-3
	Rock	46.9 – 67.4	20.5	Fractured sandstone				-			
		67.4 – 70.0	2.60	Bedrock-shale				-			
BH-2	Reclaimed	0.0 - 1.2	1.2	Poorly graded gravel with sand (GP)				-	3.59	1st: 8.5 2nd: 21.0	
	Deposited	1.20 – 7.50	6.30	Poorly graded gravel with sand (GP)	50.2	45.2	4.6	29/30			5.8 x 10-2
		7.50 – 13.0	5.50	Silty clayey sand with gravel (SC – SM)	49.9	44.8	5.9	24/30			2.3 x 10-2
		13.0 – 15.0	2.00	Clayey sand with gravel (SC)	25.1	68.0	6.9	32/30			
		15.0 – 18.0	3.00	Silty clayey sand with gravel (SC – GM)				-			
		18.0 – 19.0	1.00	Poorly graded gravel with sand and silt (GP)				-			
		19.0 – 23.0	4.00	Silty clayey sand with gravel (SC – SM)	33.1	59.6	7.3	32/30			
		23.0 – 26.0	3.00	Clayey sand with gravel (SC)	34.2	45.0	20.8	27/30			1.2 x 10-2
		26.0 – 29.0	3.00	Clayey sand with gravel (SC)				-			
		29.0 – 30.0	1.00	Clayey sand with gravel (SC)	36.1	41.0	22.9	44/30			
BH-3	Reclaimed	0.00 – 1.40	1.40	Poorly graded gravel with sand (GP)				-	3.51	1st: 7.0 2nd: 15.0	
	Deposited	1.40 – 2.50	1.10	Poorly graded gravel with sane (GP)				-			
		2.50 – 7.00	4.50	Poorly grade gravel with sand silt (GP – GM)	52.0	42.0	6.0	24/30			5.8 x 10-2 - 8.1 x 10 -2
		7.00 – 14.4	7.40	Clayey sand with gravel (SC)	41.8	42.7	15.5	23/30			2.3 x 10-2 - 3.5 x 10-2
		14.4 – 17.0	2.60	Poorly gravel with sand and silt (GP – GM)	54.0	40.0	6.0	26/30			
		17.0 – 18.5	1.50	Clayey sand with gravel (SC)				-			
		18.5 – 25.0	6.5	Poorly graded gravel with sand and silt (GP – GM)	51.0	42.0	7.0	32/30			1.2 x 10-3
	Rock	25.0 – 40.0	15.0	Devitrified sandstone				-			
		40.0 – 70.0	30.0	Fractured sandstone and shale				-			
BH-4	Reclaimed	0.0 – 0.90	0.90	Clayey sand with gravel (SC)				-	3.65	1st: 8.4 2nd: 16.0	
	Deposited	0.90 – 2.90	2.00	Poorly graded gravel with sand (GP)				-			
		2.90 - 8.00	5.10	Poorly graded gravel with sand and silt (GP – GM)	50.1	43.0	6.9	27/30			5.8 x 10-2 - 8.1 x 10 -2
		8.00 – 15.20	7.20	Clayey sand with gravel (SC)	39.1/37.6	35.0/38.1	25.9/24.3	18/30-63/30			2.3 x 10-2 - 3.5 x 10-2 1.2 x 10-3
	Weathered	15.20 – 20.0	4.80	Weathered zone of bedrock-sandstone				-			
BH-5	Reclaimed	0.00 – 3.20	3.20	Poorly graded gavel with sand (GP)				-	3,65	1st: 4.2 2nd: 7.6 3rd: 18.0 4th: 25.9 5th: 29.0	
	Deposited	3.20 – 9.90	6.70	Poorly graded gravel with sand and silt (GP – GM)	47.6	45.1	7.3	27/30			
		9.90 – 18.0	8.10	Poorly graded gravel with sand and silt (GP – GM)	42.9	40.8	16.3	32/30			2.3 x 10-2 - 3.5 x 10-2
		18.0 – 21.4	3.40	Poorly graded gravel with sand and silt (GP – GM)	47.9	45.7	6.4	26/30			
		21.4 – 25.9	4.50	Clayey sand with gravel (SC)	33.5	40.2	26.3	32/30			1.2 x 10-3
		25.9 – 27.1	1.20	Poorly graded gravel with sand and silt (GP)				-			
		27.1 – 29.4	1.90	Poorly graded gravel with sand and silt (GP – GM)	49.1	46.5	4.4	36/30			5.8 x 10-2 - 8.1 x 10-2
		29.4 – 33.0	4.00	Clayey sand with gravel (SC)	52.3	39.7	8.0	38/30			
		33.0 – 36.4	3.40	Poorly graded gravel with sand and silt (GP – GM)	39.1	42.3	18.6	40/30			
		36.4 – 50.3	13.9	Clayey sand (SC)	46.9/11.6	44.5/66.2	8.6/22.2	31/30			1.2 x 10-3
	Weathered	50.3 – 64.8	14.5	Weathering zone of bedrock-sandstone				-			
	Rock	64.8 – 70.0	5.20	Fractured sandstone				-			

Source: Made by JICA Study Team based on UB Metro F/S Survey by Korea

Geological feature for the underground structure section of the Metro is shown based on the geological survey report of Ulaanbaatar city transportation network basic survey (2009) (see Table 6.2.16). This survey compiled past boring survey results in 13 points from Sapporo Intersection to East Intersection. However, most of the data were as old as in the 1970s; new boring survey shall be implemented in EIA, and it is necessary to be confirmed.

Permanently frozen ground does not exist in the Metro planned area (see Figure 6.2.12).



Source: Geological Survey Report (2009) of Ulaanbaatar City Transportation Network Basic Survey

Figure 6.2.12 Permanently Frozen Ground

Table 6.2.16 Geological Feature Data from Sapporo Intersection to East Intersection

Hole No.	Distance from previous point (m)	Depth (m)	Thick-ness (m)	Soil composition	Under-groundwater level (m)
B-3482 (Sapporo Intersection)	-	0.0 – 1.5	1.5	Filled-up ground	-
		1.5 – 3.0	1.5	Pebbles and gravels with sand fillers with moisture	
B-4005	535	0.0 – 6.0	6.0	Pebbles and gravels with sandy loam fillers, plasticity, liquid consistency	2.3 – 6.0
B-4001	980	0.0 – 0.3	0.3	Top soil	1.9 – 6.0
		0.3 – 6.0	5.3	Pebbles and gravels with sand fillers with moisture. Water saturated from 1.9m	
B-303	449	0.0 – 0.7	0.7	Filled-up ground	3.3 – 10.0
		0.7 – 10.0	9.3	Pebbles and gravels with sand fillers with moisture. Water saturated	
B-2515 (Grand Plaza)	714	0.0 – 4.6	4.6	Filled-up ground	7.0 – 19.0
		4.6 – 9.8	5.2	Pebbles and gravels with sand fillers with moisture. Water saturated	
		9.8 – 11.5	1.7	Clay, liquid consistency	
		11.5 – 16.7	5.2	Pebbles and gravels with sandy loam fillers, liquid consistency	
		16.7 – 19.0	2.3	Pebbles and gravels with clay loam fillers, liquid consistency	
B-12 (West intersection)	328	0.0 – 2.5	2.5	Filled-up soil	3.4 – 51.0
		2.5 – 3.5	1.0	Pebbles and gravels with sandy loam fillers, solid consistency	
		3.5 – 6.5	3.0	Pebbles and gravels with clay loam fillers, liquid consistency	
		6.5 – 12.0	5.5	Clay loam, liquid consistency	
		12.0 – 18.0	6.0	Clay, liquid consistency	
		18.0 – 51.0	33.0	Pebbles and gravels with clay loam fillers, liquid consistency	
B-4926 (Ulaanbaatar Department store)	480	0.0 – 1.3	1.3	Filled-up ground	6.5 – 12.7
		1.3 – 6.3	5.0	Pebbles and gravels with sandy loam fillers, plasticity consistency	
		6.3 – 8.2	1.8	Pebbles and gravels with clay loam fillers, liquid consistency	
		8.2 – 11.0	2.8	Pebbles and gravels with sandy loam fillers, liquid consistency	
		11.0 – 12.7	1.7	Clay loam, liquid consistency	
B-4856 (In front of Russian Embassy)	592	0.4 – 5.5	5.1	Pebbles and gravels with sandy loam fillers, plasticity consistency	6.5 – 8.0
		5.5 – 3.5	3.5	Pebbles and gravels with clay loam fillers, plasticity, liquid consistency	
B-4853 (Behind Central Post Office)	460	0.0 – 0.9	0.9	Filled-up ground	7.2 – 10.0
B-125 (Next to the Ministry of Foreign Affairs)	381	0.9 – 10.0	9.1	Pebbles and gravels with sandy loam fillers, plasticity, liquid consistency	8.0 – 50.0
B-2476	567	0.0 – 0.2	0.2	Filled-up ground	-
		0.2 – 4.0	3.8	Pebbles and gravels with sandy loam fillers, plasticity consistency	
		4.0 – 6.0	2.0	Pebbles and gravels with sand fillers, with moisture	
B-2786 (Near Wrestling palace bus stop)	482	0.0 – 1.1	1.1	Filled-up ground	6.8 – 10.0
		1.1 – 6.2	5.1	Pebbles and gravels with sandy loam fillers, plasticity consistency	
		6.2 – 7.3	1.1	Pebbles and gravels with clay loam fillers, plasticity, liquid consistency	
		7.3 – 10.0	2.7	Sandstone	

Source： Made by The Project Team based on Geological Survey Report (2009) for Ulaanbaatar City Transportation Network Basic Survey

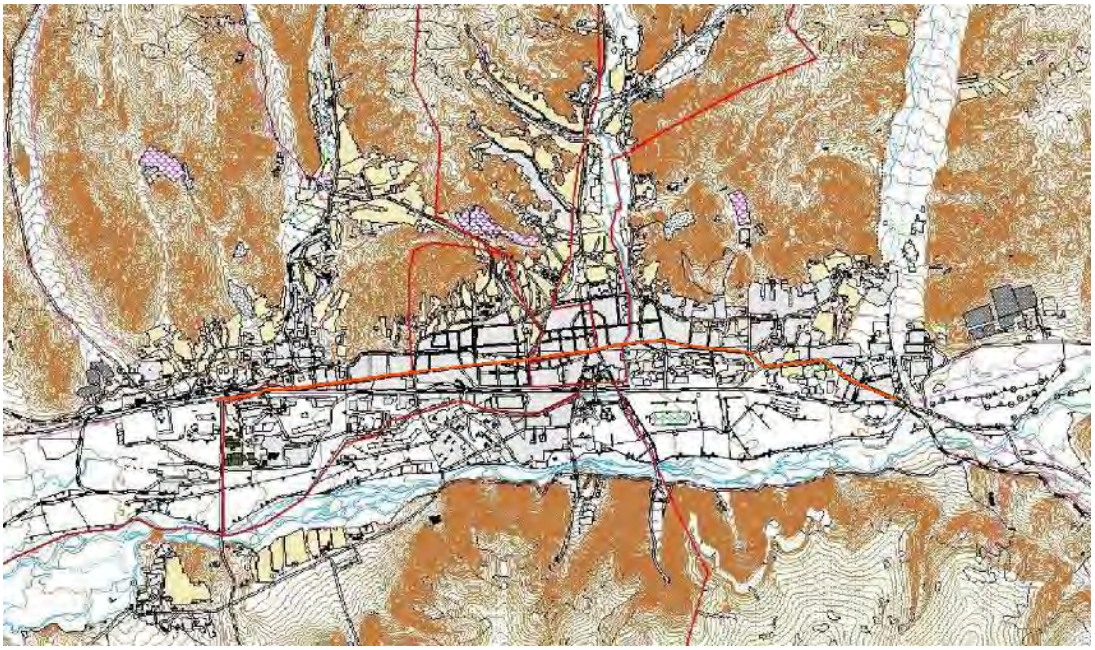
(11) Land and Natural Resource Use

The Climate of Ulaanbaatar belongs to the forest-stepped zone, and mountains around the city are forests of conifers. The central part of the city where the Metro line is planned is an urban area (see Figure 6.2.13)

As land use of the Metro planned route, there is residential area from Amgalan station to Officer's Palace in eastern side, offices of public facilities, universities, and company office buildings are located east of East Intersection. Around the Sukhbaatar square is the central business district and accumulated office building and commercial facilities; shops located in the first floor of apartment buildings continue to Sapporo Intersection. West of Sapporo Intersection are apartment areas in the north side of Peace Avenue, and industrial area in the south between Peace Avenue and Ulaanbaatar Railway. Around Tolgoit station is an industrial area.

In the eastern side between Officer's Palace and East Intersection, there is a width from 15 to 20m of green way median. The west side from around 350m west of No. 25 drug store to 600m west of dragon bus terminal, a median width from 10 to 20m exist. The Metro piers of the elevated section are planned to be built on the median.

The development of underground has not been conducted yet in Mongolia, and the law related to underground space use is not studied. Due to the proposal of the Metro project, the Ministry of Construction and Urban Development started to prepare the new law, but its establishment is not clear. It is necessary to closely work with the concerned organizations.



Source: JICA UBMPS Team

Figure 6.2.13 Land Use

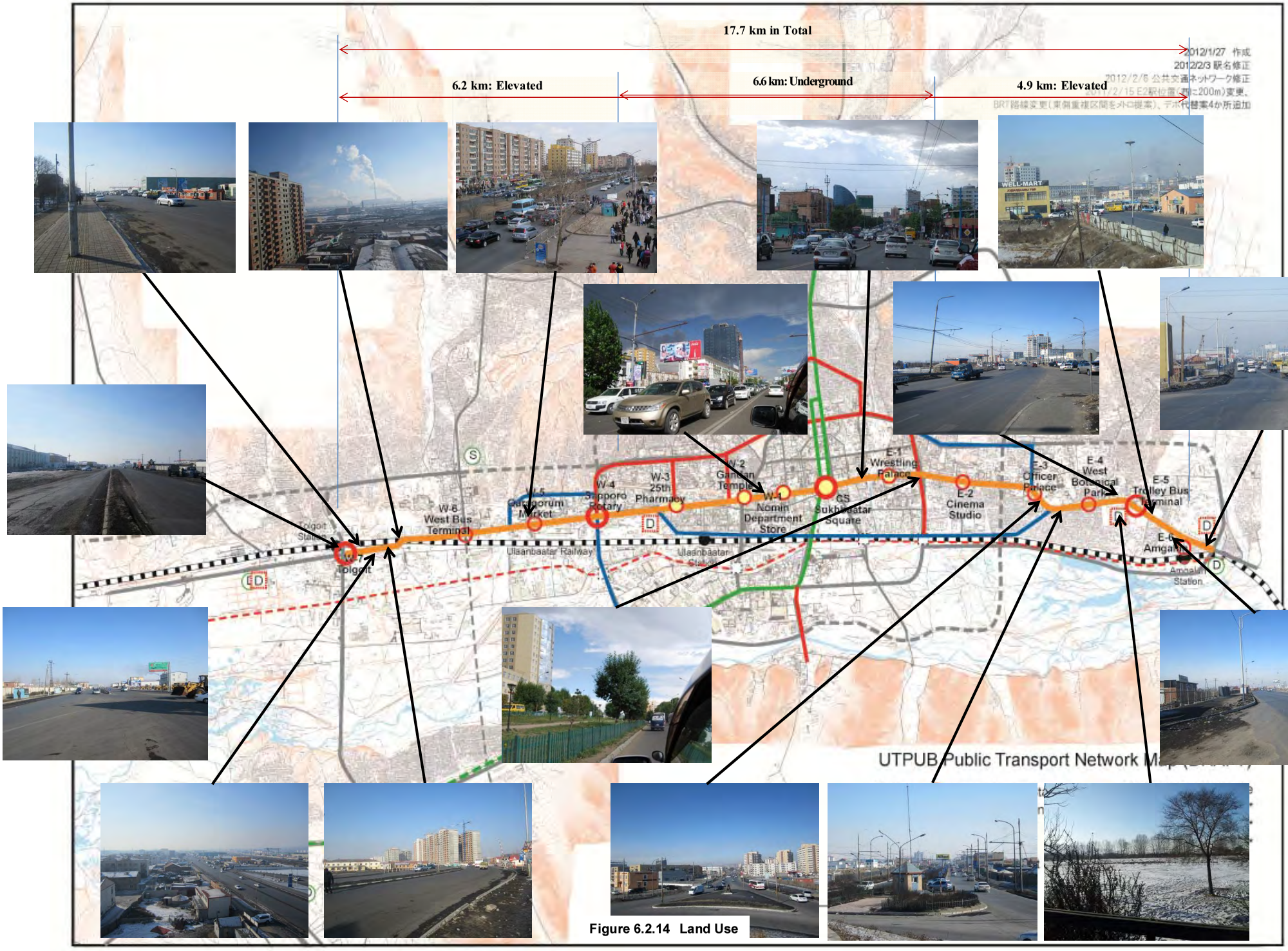
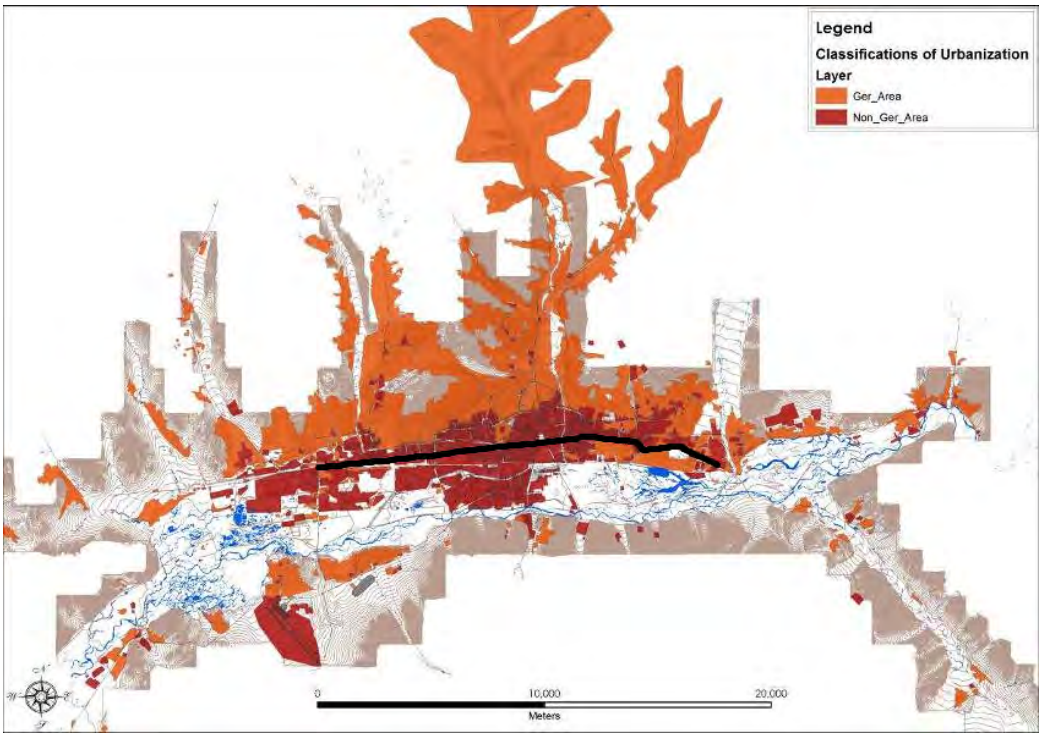


Figure 6.2.14 Land Use

(13) Living Environment

People in Ulaanbaatar are divided into two groups according to their housing types. Those who live in apartment areas are relatively rich and tend to stay longer in the city. On the other hand, those who live in ger areas have come to the city after getting their freedom of move of housing location inside the country in 1997. They belong to low and middle income classes, relatively. The houses in ger area do not have connection to basic utility services in general. Moreover valleys and mountains etc. where some ger areas locate belong to the high risk areas from flood and landslides. Along Peace Avenue where the Metro plan on, mostly apartment areas are located.



Source: JICA Study Team

Figure 6.2.15 Apartment and Ger Areas

(14) Employment

There were 361,400 employees in 2011 in Ulaanbaatar City; the number increased over the last three years. On the other hand, unemployment rate of 2011 was 5.6%, compared with 14% in 2009, and it decreased over last three years. For unemployment by district, Songinokhairkhan district was higher than others[7].

Table 6.2.17 Number of Employees and Unemployment Rate

	2009	2010	2011
Number of employees	333,800	360,900	361,400
Unemployment rate (%)	14.0	8.7	5.6

Source: Statistical Data Book of UB City-Socio-Economic Status of Capital City, February 2013

(15) Existing Social Infrastructure and Services

1) Electricity and Heating

There are currently three thermal power stations in Ulaanbaatar. The total design capacity is 709.5MW, while their operation capacity was 554.7MW in 2007. Thermal Power Plant No. 2

[7] Employment Security Bureau of Ulaanbaatar City

and 3 are very old, and No. 4 has managed approximately 70% of electricity and about 65% of heating of the city. Thermal Power Plant No. 4 using coal generates 452MW, and now major repairing work is going on. Moreover, for additional source of electricity in Ulaanbaatar City, a new station No. 5 of 450MW of coal power plant is planned to be built[8]。

The peak load has increased year by year. It was 241.8MW in 2008 increased by 15.8% compared to 2007. It was 248.5MW (2.8%) in 2009 and 282MW (13.5%) in 2010. As for electric transmission network, there are 16 sub stations to serve as a distribution network, located around the central part of the city. About 61% of total electricity consumption in 2010 distributed by five 110kV sub-stations of the West, North, East II, Tuul and South. Because many new factories and commercial facilities have constructed in recent years, the amount of electricity consumption of the city has increased by 15 – 20MW. As a result, expansion of sub-stations is needed.[9]

For heating supply capacity, the design capacity is 1,695Gcal/hour, the operation capacity is 1,594Gcal/hour, and the central heating system connecting capacity is 1,449Gcal/hour. In design capacity, 246.3Gcal/hour is allocated as the reserve capacity[10]. Hot water for heating supply is generated by middle and small size heat supply boilers in each area other than power stations.

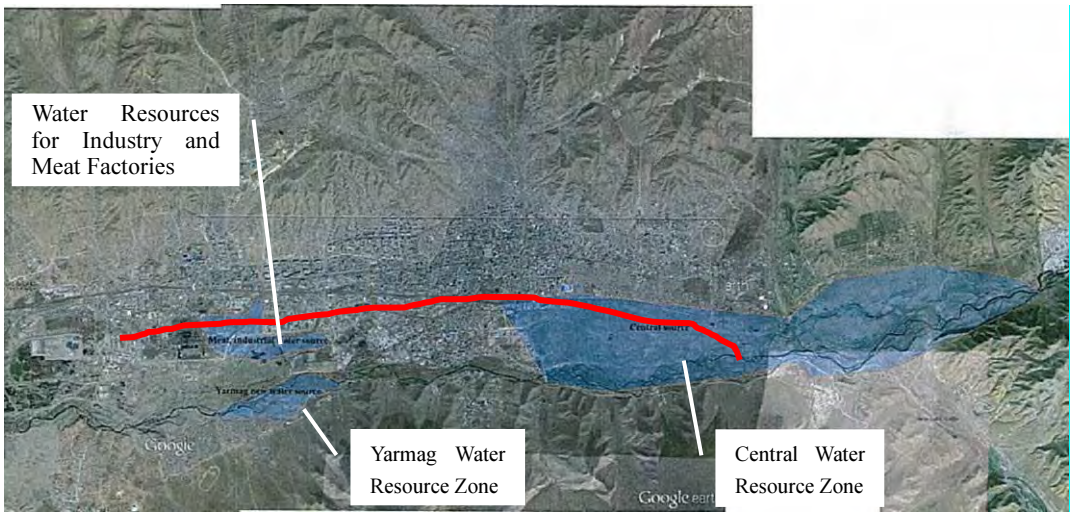
2) Drinking Water

The main water source in the city is groundwater along Tuul River from the Central Water Source Area which is located in south of the city. The amount of daily water supply was 125 thousand m^3, including for drinking water and industrial water uses and increases year by year. 80% of drinking water use in the city is from the Central Water Source Area, and the rest come from the Industrial and Meat-Complex Water Source Area (35-41 thousand m^3/day), and Upper Water Source Area (24 thousand m^3/day). Currently new water source of Yarmag and Gachuurt has been developed. Additionally, power plants which require large amount of water have own water source and use total 60-70 thousand m^3/day[11]. 55% of total households buy water from water kiosk and water truck, 38% connect to the central water supply system, and 4.5% take directly from rivers[12].

Tuul River which is the main water source of the city has suffered seasonal shortage of water since 2000. Water flow around the city and lower stream tends to dry up for 2-22 days in April. By decreasing the amount of surface water and groundwater, intake exceeds the limit of groundwater in amount. Moreover, the quality of water becomes inferior because there is a risk of water pollution from untreated waste water from ger area and broken sewage pipes.

The water intake position in Ulaanbaatar city is in three zones presented in light blue color in Figure 6.2.16.

[8] ADB implements F/S survey, and is going to carry it out by private sector.
[9] Ulaanbaatar City, UBMP2030 (Draft), 2011
[10] JICA, UBMPS, 2009
[11] Environmental Outlook of the Ulaanbaatar City, 2008
[12] Ulaanbaatar City, UBMP2030 (Draft), 2011



Source: NJS Consultants Co., Ltd.

Figure 6.2.16 Water Intake Position in Ulaanbaatar City

3) Sewage Water

The design wastewater treatment capacity in the central wastewater treatment plant was 230 thousand m_3/day, but the actual treatment capacity was 130-140 thousand m_2/day in winter and 160-170 thousand m_3/day.[13] Treated water which is discharged from the central wastewater treatment plant to Tuul River gives bad impact on the river's water quality. Because of shortage of the treatment capacity, the level of BOD, NO_2, and NH_4 of the river exceed standards.

4) Solid Waste

Solid waste is collected by government garbage trucks and dumped at three dumping sites in the city. One is Morin Davaa, located in 12th Khoroo, Khan-Uul District, receiving 60~80 tons per day from Khan-Uul District. The other one is Narangiin Enger, located in 26th Khoroo, Songinokhairkhan District, receiving 1,000 tons per day from all districts except Khan-Uul District. Additionally, a new dumping site is under construction in 24th Khoroo, Bayanzurkh District[14]. Although waste generators have a responsibility to properly dispose industrial waste, hazardous waste, and medical waste, the actual situation is not clarified and it seems those wastes are not disposed separately[15]。 Additionally, under the support of the Korean International Cooperation Agency (KOICA), a recycling factory began operation from June, 2011, which can create 1.6 tons of solid fuels per day from 80 tons of waste.[16].

5) Social Service Facilities

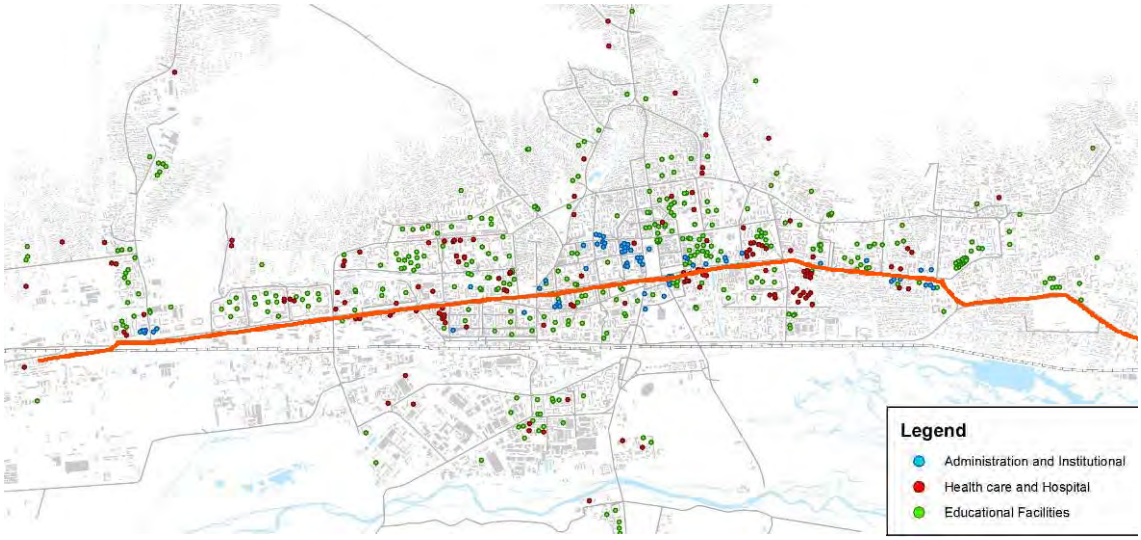
Education and medical facilities located around the Metro planned site are shown in Figure 6.2.17. Because the planned site is on the arterial road which runs in the center of the city, there are many social service facilities around the site.

[13] Source: Preparatory Survey (Basic Design) on the Ulaanbaatar Water Supply Development Project in Gachuurt in Mongolia, March 2010 , JICA

[14] Based on an interview to an expert of Environmental Pollution and Waste Management, Division of the Mayor's Office, Ulaanbaatar City

[15] Final Report of "The Study on Solid Waste Management Plan for Ulaanbaatar Municipality in Mongolia" (JICA, March, 2007)

[16] Based on an interview to an expert of Environmental Pollution and Waste Management, Division of the Mayor's Office, Ulaanbaatar City



Source: JICA Study Team

Figure 6.2.17 Social Service Facilities

(16) Cultural Heritages and Historical Buildings

There are many cultural heritages and historical buildings around the Metro planned site on Peace Avenue. These are mapped and listed in Figure 6.2.18 and Table 6.2.18 respectively. Most of these are not affected by the project.

Source: UBMPS, 2009, JICA

Figure 6.2.18 Cultural Heritages and Historical Buildings

Table 6.2.18 Cultural Heritages and Historical Buildings

No.	Name of Heritage	No.	Name of Heritage
City Level			
1	Tsogtdambajavyn house	21	Kh. Choibalsan monument
2	First European style 2 storey building	22	B. Tserendorj monument
3	2 stone lion sculptures in Arslantai bridge	23	S. Zorig monument
4	Memorial park in Altan olgii	24	Y. Lkhagvasuren monument
5	Mongolian revolutionists house in Konsulyn denj	25	‘’Horse breaking” sculpture
6	House where lived Mongolian revolutionists	27	State ceremony palace
7	D. Sukhbaatar monument	28	State seal symbol monument
8	“Mongol ard” monument	29	B. Renchin monument
9	D.K. Jukov monument	31	Some buildings of the Bogd Khan’s summer Palace Complex
10	Dandarbaatar monument	32	Monument for warriors
11	D. Sukhbaatar statue in his birth place	37	Monument for workers
12	House where lived N.K.Rerikh	39	First department store
13	Yu. Tsedenbal monument	40	2 stone lion sculptures in front of the Natural Historical Museum
15	2 stone lion sculptures in front of the Mongolian National University	41	Mongolian and Russian revolutionists house
16	Capital city foundation monument	43	Monument for political repression
17	Place where lived former prime minister P. Genden	44	P.E. Shetinkin monument
18	D. Natsagdorj monument		Rock with memorial historical words
19	D. Sukhbaatar monument (with horse)		Khunnu time graves in Belkhiin am
20	V.I. Lenin monument		
National Level			
45	Geser Temple		2 stone columns of the Dari Ekh Temple
46	Gandantegchilen Monastery		Rock painting in Ikh Tengeriin am
	Bogd Khaan’s Green Palace		Megjid Janraisig monastery
	Rock painting in Gachuurtyn am		Graves in Songinokhairkhan mountain
	Ger shaped wooden monasteries		Chin Van Khanddorj’s house
	Dambadarjaa Monastery		Choijin Lama Temple

Source: UBMPS, 2009, JICA

(17) Landscape

The most important landscape around the project planned site is Sukhbaatar Square located in the center of Ulaanbaatar, along Peace Avenue. This is used for special occasions including the ceremony of Naadam and is the landmark of the city. There are the statue of Sukhbaatar in the middle and the statue of Chinggis Khan in the north. The square is located by landmark building, i.e. the parliament in the north, the opera house in the east, and the city hall in the west.

Others are the corridor which connects the Nomin Department Store and the Circus; and the corridor which links Sukhbaatar Square and the Ulaanbaatar Hotel. People use these corridors as a place to relax and meet with friends and family.

The Metro route to these places is the underground section, so it does not have any impact to its landscape.

6.3 Stakeholder Meeting

It is important to raise transparency in the preliminary phase to implement sufficient environmental and social considerations. To reflect variety of senses to decision making as much as possible, communication with the citizen was desirable from the early stage. Therefore, the stakeholder meetings were held for the related persons to discuss overview and environmental and social consideration impacts by the Metro project.

The stakeholder meetings were held twice. The first meeting in July 2012 was held to introduce the outline of the Metro project for the preliminary phase before the preparation of scoping of environmental and social impact. The second meeting in October, 2012 was held to explain the outline of the Metro project and the draft scoping of environmental and social impacts and discussed about them.

(1) Outline of the First Stakeholders' Meeting

The outline of the first stakeholder meeting is shown in Table 6.3.1, and comments/ questions from participants and the answers are shown in Table 6.3.2.

Table 6.3.1 Outline of the First Stakeholder Meeting

Item	Contents	
Date	July 3, 2012 (Tuesday)	
Time	10:00～12:00	14:10～15:40
Purpose	・To share information for transportation measures in Ulaanbaatar city, especially transportation network, the outline of the planned Metro project, and necessity of environmental and social consideration ・To discuss about them among participants	
Target persons	Public administrators	Environmental NGO, intellectual persons, and private enterprise, etc.
Contents	・Necessity of transportation network ・Outline of the Metro project ・Explanation of the project policy ・Introduction of alternative measures ・Environmental and social consideration system in Mongolia ・Public discussions	
Venue	Mongolia Japan Center	
Access to venue	Considering access to meeting place, which is located in the center of Ulaanbaatar city.	
Invitation method of participants	Sending invitation letter to related organizations, newspapers advertisement and appeal to Khoroo offices	
Languages	Mongolia and Japanese	
Contents of presentation	Outline of the Metro project, project policy, and outline of environmental and social consideration survey	
Explanation method of presentation	Explanation by using powerpoint and its handout	

Table 6.3.2 Comments/Questions and Answers from Participants

Organization	Sex	Comment/ Question	Answer
Public Transportation Department of Ulaanbaatar City	Male	An item about the insurance is not included.	There are various insurances, for example construction insurance, the third party liability insurance to apply passengers' injuries after operation starts, and fire insurance. In the future, selection of insurance will be discussed to decide types of necessary insurance and the amount of compensation.
Environmental Citizenship Association NGO	Male	There is description to promote non-power traffic (walk, bicycle), but it is difficult to realize it in Mongolian climate.	To take pedestrian space widely to be able to walk and use bicycle. Although it may be difficult in winter season to promote it, it comprehensively fits with the master plan of Ulaanbaatar city.
		Examination of alternative plan is important for the SEA process, but the survey seems to determine the Metro construction from the beginning. Is there alternative plan? What kind of method does SEA conduct used? For SEA which guideline is followed– Japanese way or Mongolian?	Examination of alternative plan is conducted, but in this meeting the best plan is explained. The EIA law of Mongolia was revised, but SEA guidelines have not been revised yet, so basically JICA guidelines are used for SEA. It is necessary to coordinate with revision of guidelines during the survey period.
Monwecom Co., Ltd	Female	How much is the congestion degree in Japan? Traffic cost is estimated at 11.2 times which is higher than that of 2010. It is big burden for society and economy. Is it reliable against increase of 1.4 times in population growth rate and 3.1 times in transportation demand?	The traffic congestion degree in Japan considerably varies by road. There is high congestion degree in downtown of big cities, and low degree in local area. The degree and cost is estimated by traffic demand forecast data in Ulaanbaatar city, so it has certain amount of reliability.
National University of Mongolia	Male	The EIA law was revised, and new SEA was introduced. Do you obtain the revised EIA law? What kinds of members from Mongolian side participate in the environmental and social consideration team? In overseas aid projects in general, contents of reports seem not to fit the law and the characterization of Mongolia. Mongolian experts, environmental NGO and so on should participate in it as stakeholders.	Revised EIA law is being reviewed in the government, and is not available in public. The team has not obtained it yet. When revised EIA becomes available, it will be reflected in the survey. The survey is going to be investigated in accordance with the Mongolian law, and other related plans.
Resident in Bayangol district	Male	How the depth of tunnel is calculated? Is it based on the international standard? Geological features are different by places, are they considered? Is earthquake survey conducted?	There is no international standard. In Japan, depth is different in urban area and local area. Of course, it is easy to construct shallow one, but depth of tunnel is decided considering underground utilities not to harm. As for geological features, the team

			collects information by place. About the earthquake, the team refers to a survey report of ADB. In case of earthquake, it can be said that Metro is the safest based on Japanese experiences.
Resident in Sukhbaatar district	Male	By constructing the Metro, does the number of microbus of the existing public transportation decrease? There are many private companies. I am concerned that they may object. Did the study team examine that? What do you think of the business hours of the Metro?	It is possible that the number of microbus decreases, but employment can increase by the organization of new routes. Business hours are not decided yet but are assumed from 5 or 6 am to 10 pm.
Resident in Bayangol district	Male	Which power station does electricity come from? Does the Metro construction and infrastructure maintenance need to be conducted at the same time?	The Metro is expected to operate in 2020. There is the plan that enlargement of thermal power plant No.3 and No. 4 and facilities maintenance will be implemented by that time. Infrastructure development is expected to be implemented at the same time with the Metro.

(2) Outline of the Second Stakeholders' Meeting

Outline of the second stakeholders' meeting, questions and answers are shown in Table 6.3.4.

Table 6.3.3 Outline of the Second Stakeholders' Meeting

Item	Content
Date	October 3, 2012 (Wednesday)
Time	10:00～12:50
Purpose	To share information on existing environmental and social conditions and draft scoping To discuss them among participants
Target persons	Administration, environmental NGO, intellectual persons, and private enterprise, etc.
Contents	・Environmental standard of Mongolia and current condition ・Introduction of draft scoping to implement EIA ・Public discussion
Venue	Mongolia Japan Center
Access to venue	Considering access to meeting place, which is located in the center of Ulaanbaatar city.
Invitation method of participants	Sending invitation letters to related organizations and attendees of the first stakeholders' meeting, newspapers advertisement and appeal to Khoroo offices
Languages	Mongolian and Japanese
Contents of Presentation	Outline of the Metro project, project policy, and outline of draft scoping of environmental and social impacts
Explanation Method of Presentation	Metro project video, explanation by using powerpoint and its handouts

Table 6.3.4 Comments/ Questions and Answers from Participants

Organization	Sex	Comment/question	Answer
CLEM (Central Laboratory of Environment and Metrology)	Male	What kind of calculation method was used for population growth rate? How was the Metro fare calculated? How was the electricity power procured? Shall soundproofing wall of the Metro area be set up?	The population growth rate and the economic growth rate information come from the Construction, Urban Development and Planning Department of Ulaanbaatar city. Fare is calculated based on the present bus fare, but it may be changed in the future due to inflation. Under the operation of the Metro, the government will decide on the fare. The electricity is provided through building thermal power plant No.5. Along the route of the Metro, soundproofing wall will be installed.
Ministry of Economy and Development	Female	Did traffic index consider parameters of ADB project? By the presentation about the environmental and social considerations, environment impacts are focused. I think that social and economic impacts should be assessed.	ADB traffic index used results of UBMPS. ADB referred to JICA project index.
Citizen	Male	I think the Metro is excellent, because traffic jam is mitigated by the Metro. Can the project extend the Metro route?	The Metro covers 70% of the population of Ulaanbaatar city. Passengers other than Ulaanbaatar citizens can use it. Extension of the Metro route shall be examined after the Metro start operation.
NGO Representative	Male	I heard that the investment amount of the Metro project is much higher than highway construction. How much is the total cost, and how shall the team procure budget for the Metro construction?	The total cost is estimated about 1,500 million dollars. Almost 50% of total cost is procured by Mongolian government, and 30-40% is by the Japanese government or other donors. The Metro construction period is approximately four years.

6.4 Proposed Items on Environmental and Social Considerations for EIA and their Evaluation Methods

6.4.1 Screening and Environmental Category of the Project

This project is for developing the Metro, which is categorized as Level A in the "Guideline for Environmental and Social Consideration" of JICA issued in April 2010. The project will implement underground construction and sufficient considerations on possible negative effects seem necessary. Possible negative effects are related to topographical and geological features such as land subsidence, groundwater pollution, air pollution, noise/vibration and accidents during construction and noise/vibration after the Metro operations begin. This project will be defined as a case where negative effects to human health and natural environment are expected to be large or impossible to be estimate, detailed investigation is necessary, or large scale of natural resources are developed by the project implementation at the GEIA stage, and therefore DEIA will be required to conduct.

Based on the Metro plan which is proposed in this report, land acquisition is necessary but

involuntary resettlement is less expected.[17]

6.4.2 Draft Scoping

The plan and design of the project needs sufficient considerations for environmental and social acceptance. Expected environmental impacts by the project and draft-scoping plan was examined based on the first and second stakeholders meetings and the present status summarized above.

(1) Coverage for Scoping

The area for scoping includes the "Ulaanbaatar Metro Line 1 (East and West line)" of 17.7 Km lengths (elevated railroads of around 11.1 km and underground railroads of around 6.6 km) and candidate areas for the depot. The project does not include related projects conducted by Ulaanbaatar city like station area development.

(2) Draft Scoping

The results of scoping for the above mentioned area as shown in Table 6.4.1 are based on the site visit survey, measurements, interview survey, stakeholders meetings, and literature reviews. In the literature review, following reports were reviewed: the F/S study conducted by the Korean company under contract with Ulaanbaatar city in 2009, "The Study on City Master Plan and Urban Development Program of Ulaanbaatar City" by JICA in March 2009, and "Capacity Development Project for Air Pollution Control in Ulaanbaatar City, Mongolia (ongoing project)" and so on.

Table 6.4.1 Draft Scoping

Impacts	Evaluation		Explanation on Evaluation
	Before and during construction	Under operation	
Pollution			
Air	A-	B+	**Before and during construction:** Air pollution will temporarily become worse due to exhaust gas by construction machines and vehicles, fugitive dust and traffic congestion. **Under operation:** Air pollutant emission by automobile use will be expected to be reduced by traffic reduction and traveling speed increases resulting from the modal shift from automobile to the Metro.
Water	A-	D	**Before and during construction:** River water and groundwater pollution will temporarily become worse due to effluent water by construction and related facilities, and excavation. **Under operation:** No serious impact is expected since a drainage system will be used for wastewater from station facilities.
Soil	C-	C-	**Before and during construction:** The Environmental Pollution Department of Ulaanbaatar city pointed out that soil contamination by lead is a problem and one of the causes is lead-contained exhaust gas from automobiles using leaded gasoline. However, use of leaded gasoline was prohibited in 2007, and there is no evidence of leaded gasoline importations at present. Lead contamination cannot therefore be expected during construction. Television reports which indicated probable lead gasoline use was broadcasted in 2012 and investigations into use of lead gasoline was considered necessary. **Under operation:** If treatment of wastewater like washing water from train basis is insufficient, soil contamination occurs.
Waste	A-	B-	**Before and during construction:** Soil waste from tunnel

[17] In this report, depot site selection has not been done but alternatives are proposed. For the depot site selection in the further study, the size of resettlement area will be considered and if the number of population for resettlement exceeds 200 in some candidate sites, these will be excluded from the alternatives.

Impacts	Evaluation		Explanation on Evaluation
	Before and during construction	Under operation	
			excavation and construction waste will be generated. Suitable waste management, such as soil outflows countermeasures, is necessary for soil dumping sites. **Under operation:** Waste will be generated from stations and train depot.
Noise/ Vibration	B-	A-	**Before and during construction:** Noise by the operation of construction machines and vehicles is expected. **Under operation:** Noise by trains running on the ground and elevated sections, and vibration by trains running on the whole line is expected.
Subsidence	C-	D	**Before and during construction:** Subsidence by groundwater level change is not expected because fine sand and silt is less in the construction site ground. Additionally, proposed shield tunneling method generally does not cause ground subsidence under normal tunneling management. However, it is necessary to be confirmed by soil survey. **Under operation:** No pumping of groundwater that causes subsidence is requested, no large impact is expected.
Odor	D	D	**Before and during construction:** No work which causes odor is expected. **Under operation:** No work or facility which causes odor is expected.
Sediment	D	D	**Before and during construction:** No work which affects sediment is expected. **Under operation:** No activity which affects sediment is expected.
Natural Environment			
Protected Area	D	D	The project site is far from areas protected by the Law on Special Protected Areas and there will be no impact.
Ecosystem	C-	C-	The surroundings of the project site are urban and does not include rare species in biota or ecosystem requiring special consideration. However, a part of routes and one candidate for train depot are planned in part of a botanical garden owned by the National Science Academy. Thus, an ecosystem impact examination is necessary.
Hydrology	A-	C-	Under the project sites, it is expected that a groundwater vein from a northern hill to the southern reverbed of Tuul River and Selbe River exists. **Before and during construction:** There are possibilities of changes of groundwater level and water flow direction by water shielding of underground routes and pumping and pouring of water during construction. It is reported that use of groundwater is prohibited in surroundings of the planned underground section, but examination of the information is necessary. **Under operation:** Hydrology might somehow be affected because of underground facilities. Underground hydrology change may affect the flow volume of Tuul River. These need to be assessed. Additionally, effect on flooding which is caused by heavy rain in every few years is necessary to be checked.
Topography and geology	D	D	**Before and during construction:** Topography of the project sites is gentle and most of the routes are planned as elevated or underground, so any large embankment or excavation is not expected. **Under operation:** Because ballast-less track is applied for reduction of maintenance costs and weight saving, ballast preparation is not necessary. Changes in topography and geography are not expected.
Ground Freezing	D	D	Groundwater may freeze from ground surface to GL–3 to 4 meters. Impact on ground freezing is not expected because the tunnel is designed below freezing depth.
Climate Change	A-	B+	**Before and during construction:** GHG emission will temporally

Impacts	Evaluation		Explanation on Evaluation
	Before and during construction	Under operation	
			increase because of fuel consumption by construction machines and vehicles. **Under operation:** GHG emission reductions by automobile use are expected by traffic reduction and traveling speed increases resulting from the modal shift from automobile to the Metro.
Social Environment			
Involuntary Resettlement and Acquisition	B-	D	**Before construction:** The plan was made under the condition of minimizing involuntary resettlement and acquisition. As a result, in this plan, land acquisition is necessary only at the station near the botanical garden, train depot and its connection to the main line; and involuntary resettlement is not generally necessary. However, after detailed designs, (1) gateway of stations, (2) gateway to the underground section for construction, and (3) "West Intersection" where piers of flyover roads may affect the Metro construction, may requires expropriation. Although these sites are generally located in public lands, small scale involuntary resettlement may be necessary. Under the detailed planning from now, if possibility of involuntary resettlement is found in any option, possible resettlement populations estimated precisely, and then the option may be excluded from the plan and rethink the site selection if resettlement is not small. **During construction and Under operation:** Involuntary Resettlement is not expected in construction or operation.
Land Use	C-	C+	**Before and during construction:** If the botanical garden is selected as train depot, green area would decrease. **Under operation:** Intensive land use and economic vitalization is expected by developments along the Metro line and stations.
Public Health	C-	D	**Before and during construction:** Impact by construction of lodgings for workers is expected, but its impact is considered limited because construction period is not long. **Under operation:** Negative impact to public health is expected.
Risks by Infections	D	D	**Before and during construction:** There are risks of infections occurrence including HIV and so on by inflow of workers, but its impact is considered limited because construction is short-term. Furthermore, it is expected to be manageable through education and training of workers if management of inflowing workers follows the way of on-going large-scale projects. **Under operation:** Inflows from other areas were mainly due to the snow disaster. There is little possibility of infection risk change by the Metro operation.
Impact on Road Traffic	A-	B+	**Before and during construction:** There is possibility of traffic congestion due to an increase in construction vehicles and land occupation. **Under operation:** **P**lans like intermodal and station area development are proposed, and as their results of the modal shift from automobile to the Metro a positive impact on traffic congestion is expected.
Impact on Users of Existing Public Transportation	B-	B+	**Before and during construction:** There is a possibility of traffic congestion worsening due to an increase in construction vehicles and land occupation. **Under operation:** There will be a positive impact for many citizens since there is high possibility of smooth transportation by the Metro operations and less traffic congestion. The route reconstruction plan for bus service will be investigated by the Public Transportation Department of Ulaanbaatar city. Due to introduction of the Metro on arterial road large size buses would provide main feeder routes services. To reduce burden for users who live in suburban areas and probably take feeder buses, introduction of IC card tickets, setting of transit fees and transit facility at station will be considered.
Impact on	B-	B+	**Before and during construction:** There is possibility of

Impacts	Evaluation		Explanation on Evaluation
	Before and during construction	Under operation	
Operators of Existing Public Transportation			increased traffic congestion due to an increase of vehicles and land occupation for construction. **Under operation:** Passengers may decrease after the Metro operation. Reconstruction of existing large bus routes is examined and there is possibility of reconstruction of existing large bus companies and personnel reduction.
Division of Area	D	D	Part of the Metro line runs on ground, but the route is planned in a median strip of the existing arterial road; hence the dividing of the area is not occurred due to the project. Train depot is expected to be built in lands not open to public, such as existing land for railway and the botanical garden and so on. Hence the dividing of the area is not occurred due to the project.
Sunlight Obstruction	B-	B-	The site is located at around 48 degrees north latitude and there is a possibility of sunshine obstruction at the northern side of the elevated section.
Electromagnetic Interference	B-	B-	Because a television tower is located at the northern side of the route, there is a possibility of electromagnetic interference at the southern side of the elevated section.
Heritage	C-	D	**Before and during construction:** Moving monuments and other structures at the roundabout near Officer's Palace station is probable. **Under operation:** There is no heritage, which cannot be moved, at lands on the route and train depot candidates, so no large impact is probable after operation.
Landscape	B-	B-	**Before and during construction:** There is no special landscape for consideration, but landscape will be changed by construction. **Under operation:** There is no special landscape for consideration, but landscape will be changed by the elevated structure. Since sites to be considered in the landscape, including Sukhbaatar Square are generally located in the central part of the city along the underground section, impact on landscape is limited.
Poor People, Ethnic Minorities and Indigenous People	D	D	**Before and during construction:** There is no residential place of poor people, ethnic minorities and/or indigenous people. **Under operation:** Positive impact, such as easier commuting and access to working places, social services and market places and so on, is expected because mobility of citizens without their own vehicle will be improved. Economic benefit will be improved accordingly.
Working Environment	B-	D	**Before and during construction:** Consideration of working environment of construction workers is necessary. **Under operation:** No negative impact is expected on workers for the Metro operation.
Impact on Underground Utilities	D	D	**Before and during construction:** There are risks of damaging the underground utilities by the boring survey and construction work. Points for the boring survey will be carefully selected and the survey will not be conducted during wintertime when heating systems cannot stop working. Therefore, the impact is considered extremely minimal. Risk will be avoided by constructing tunnel deeper than the utilities. **Under operation:** No event which can damage the underground utilities is to be expected.
Local Economy Employment Opportunity and Means of Livelihood	B+	C-	**Before construction:** No impact on employment opportunity is expected. **During construction:** Employment opportunities for construction work will increase. **Under operation:** The number of operations of buses and trolley buses on Peace Avenue will decrease. Enlarging trolley buses on the other routes and reconstruction to feeder routes which connects the Peace Avenue to other areas are to be examined.

Impacts	Evaluation		Explanation on Evaluation
	Before and during construction	Under operation	
			Examination is also necessary on whether the impact on employment opportunity is positive or negative. Various employment opportunities are expected to be created on the Metro operations.
Other Impacts on Daily Life	D	B+	**Before and during construction:** No other impact on daily life is expected. **Under operation:** Commuting and access to social services and market places will be easier as one of the benefits of the Metro. Positive impacts such as no waiting in the cold temperature at stations during wintertime are certain.
Others			
Accidents	B-	C-	**Before and during construction:** Accidents during construction work and operations of vehicles are expected. Capacity building in relation to daily inspection and maintenance is required by the start of operation in order to minimize accidents. **Under operation:** Because the Metro is the first urban railway system in Mongolia, countermeasures against accidents involving operators and passengers, power failure reduction measures, and countermeasures against power failure are necessary.

Notes: Evaluation Criteria

A-: Negative significant impact is supposed. A+: Positive significant impact is supposed.

B-: Negative impact is fair. B+: Positive impact is fair.

C-: Negative impact is slight. C+: Positive impact is slight.

D: No impact or extremely minimal impact is supposed.

Source: JICA Study Team

(3) Draft DEIA Specification-Contents, Prediction and Assessment Methodology

Based on the draft scoping above, a draft DEIA specification is developed as presented in Table 6.4.2, including its baseline survey, prediction and assessment methodology.

Table 6.4.2 Baseline Survey Content, Prediction, and Assessment of EIA Items in Implementation Steps of Projects (Draft)

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
Air	NO_2, PM_{10}	(Before and during construction) - Operation of construction equipment - Operation of vehicles to transport materials and equipment	1. Survey Items Meteorology (wind direction and wind speed), NO_2, and PM_{10} 2. Basic Method of the Survey - Literature review Collect, organize, and analyze the meteorology and existing atmospheric environment monitoring data. The target period shall be the most recent 3 years. - Field survey Operate measurement survey according to the measurement method set by the Mongolian Standard to obtain meteorology, NOx and PM_{10} data. 3. Survey Areas Areas which may be affected by NOx and PM_{10} emitted by operation of construction equipment or vehicles used to transport materials and equipment targeting tunnels, underground stations, elevated section, depot, and ventilation facility. 4. Survey Locations Select about five locations assumed to be affected by operation of construction equipment. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period 4 times of weeklong continuous field surveys (At least one survey must be conducted in winter when high	1. Estimation Items NO_2 and PM_{10} which will be emitted by the operation of construction equipment or operation of vehicles to transport materials and equipment. 2. Estimation Method Estimate quantitatively by using Plume/ Puff equations. 3. Estimation Area Set as similar to “Survey Areas”. 4. Estimation Location Select the location that will be affected the most, within the estimation area. 5. Estimation Target Period The target period shall be the peak of construction.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider the consistency with the Mongolian environmental standards of NO_2 and PM_{10}.

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
			concentration is expected.)		
	Dust	(During construction) - Operation of construction equipment - Operation of vehicles to transport materials and equipment	1. Survey Items Meteorology (wind direction, and wind speed) 2. Basic Method of the Survey - Literature review Collect, organize, and analyze the meteorology and existing atmospheric environment monitoring data. The target period shall be the most recent 3 years. - Field survey Operate measurement survey according to the measurement method set by Mongolian Standard to obtain meteorology data. 3. Survey Areas Areas which may be affected by dust emitted by operation of construction equipment or vehicles used to transport materials and equipment targeting tunnels, underground stations, elevated section, depot, and ventilation facility. 4. Survey Locations Select about five locations assumed to be affected by operation of construction equipment. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period 4 times of weeklong continuous field surveys (At least one survey must be conducted in winter when high concentration is expected.)	1. Estimation Items NO_2 and PM_{10} which will be emitted by the operation of construction equipment or operation of vehicles to transport materials and equipment. 2. Estimation Method Estimate quantitatively by analysis. 3. Estimation Area Set as similar to “Survey Areas”. 4. Estimation Location Select the location which will be affected the most, within the estimation area. 5. Estimation Target Period The target period shall be the peak of construction.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider Total Suspended Particulate (TSP) acceptable concentration which can be estimated by PM_{10} air quality standard and PM_{10}/TSP ratio

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
Water	Turbidity and pollution of rivers	(Before and during construction) - Excavation works or removing existing structure - Construction of tunnels - Installation of construction yard and roads	1. Survey Items Suspended Solids (SS), hydrogen ion concentration (pH), discharge, meteorology, and soil quality. 2. Basic Method of the Survey - Literature review Collect, organize, and analyze the water quality data of public waters. The target period shall be the most recent 3 years. - Field survey Operate measurement survey according to the measurement method set by Mongolian Standard to obtain SS, pH, and discharge. 3. Survey Areas Rivers which may be affected by excavation works, removing existing structure, construction of tunnels, and installation of construction yard and roads for construction of tunnels, underground stations, elevated sections, depot, and ventilation facility. 4. Survey Locations Select four locations from rivers which are assumed to be affected by construction. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period 4 times per year for field survey (Schedule should be selected to cover seasonal characteristics of water quality)	1. Estimation Items Suspended Solids (SS) and hydrogen ion concentration (pH). 2. Estimation Method Estimate quantitatively by analysis. 3. Estimation Area Set as similar to “Survey Areas”. 4. Estimation Location Select the estimation location that will be affected by the excavation works, removing existing structure, construction of tunnels, and installation of construction yard and roads within the estimation area. 5. Estimation Target Period The target period shall be the construction period.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider the consistency with the Mongolian water quality standards.

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
	Quality and water level of groundwater	(Before and during construction) - Excavation works, removing existing structure, and construction of tunnels and elevated structure (Under operation) - Presence of tunnels, elevated structure, and stations	1. Survey Items Groundwater quality (water temperature, pH, transparency, conductivity) and water level. 2. Basic Method of the Survey - Literature review Collect and organize the distribution and measured data of wells and spring water. Conduct a visiting survey for areas largely affected, since literature information is not available in many cases in Mongolia. - Field survey Conduct measurement survey according to the measurement method set by the Mongolian Standard or Japanese guideline on groundwater survey and monitoring 3. Survey Areas Wells and spring water around tunnels, underground stations, elevated sections, depot, and ventilation facility, which may be affected by excavation works, removing existing structure, and construction of tunnels and elevated structure. 4. Survey Locations Select about six locations from rivers assumed to be affected by construction. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period Field survey: 3 times for groundwater level, once for groundwater quality.	1. Estimation Items Groundwater affected by excavation works, removing existing structure and construction of tunnels and elevated structures. 2. Estimation Method Groundwater quality: evaluate quantitatively by considering influencing factors. Groundwater level: estimate by quantitative method, or estimation method. 3. Estimation Area Set as similar to “Survey Areas”. 4. Estimation Location Select the estimation location which can estimate adequately by considering distribution of groundwater within the estimation area. 5. Estimation Target Period The target period shall be the construction period or after completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider the consistency with the Mongolian water quality standards.

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
Soil	Soil contamination	(Before and during construction) - Excavation soils or removing existing structure - Construction of tunnels	1. Survey Items Contamination of soil and geological conditions. 2. Basic Method of the Survey - Literature review Collect and organize the documents and data relating to soil contamination. Conduct on-site survey accordingly to complement literature review. 3. Survey Areas Construction areas within construction project zones targeting tunnels, stations, elevated section, and depot.	1. Estimation Items Soil contamination accompanies with excavation soils, construction wastes, and construction of tunnels. 2. Estimation Method The influence of implementation of the project shall be grasped quantitatively by considering project characteristics and soil types and their distribution. 3. Estimation Area Estimation area shall be set as the project target area. 4. Estimation Target Period The target period shall be the construction period or after completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider the consistency with the Mongolian soil quality standards.
Waste	By-product accompanies with construction	(Before and during construction) - Excavation soils and construction wastes accompanied with construction. (Under operation) - Wastes from the Metro stations and depot.	1. Survey Items Operation of waste management 2. Basic Method of the Survey - Literature review Collect and organize documents and data relating to waste. Conduct on-site survey accordingly to complement literature review. - Interview survey Confirm waste management methodologies through interviews on public administration. Survey soil waste management as follows; 1) Volumes of soil waste from the Metro construction	1. Estimation Items Disposal condition of excavation soils and construction wastes. 2. Estimation Method Estimate the waste amount and disposal condition/method during construction and operation by quoting and analyzing case studies. 3. Estimation Area Estimation area shall be set as the project target area. 4. Estimation Target Period The target period shall be the construction period or after completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.

EIA Items			Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements		Effecting Factors			
			2) Methods of waste processing and disposal 3) EIA on sites to where waste will be delivered 4) Development of mitigation and monitoring plans 3. Survey Areas Construction sites and waste dump sites		
Noise	Construction noise / road traffic noise Noise of running the Metro	(Before and during construction) - Noise from operation of construction equipment and vehicles (Under operation) - Running the Metro above the ground and elevated sections.	1. Survey Items Environmental noise and ground surface conditions. 2. Basic Method of the Survey - Field survey Environmental noise: operate measurement survey according to the measurement method set by Mongolian Standard. Surface conditions: operate on-site survey. 3. Survey Areas Areas affected by noise from operation of construction equipment and vehicles. 4. Survey Locations Select 10 locations within areas affected by construction. Use survey locations of F/S for reference. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period Once for one day (24 hours) on a weekday.	1. Estimation Items Estimate noise from operation of construction equipment and vehicles. 2. Estimation Method Estimate the noise by adding operation noise of construction equipment and vehicles to the noise before construction. 3. Estimation Area Set as similar to “Survey Areas.” 4. Estimation Location Select the estimation location that can estimate the influence of noise from operation of construction equipment and vehicles adequately within the estimation area. 5. Estimation Target Period The target period shall be the construction period or after completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body. - Consider the consistency with the Mongolian noise standards.

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
Vibration	(Under operation) - Vibration assumed from operation of the Metro throughout the whole line.	1. Survey Items Environmental vibration and ground conditions. 2. Basic Method of the Survey - Literature review Collect and organize the ground condition from documents and data. - Field survey Environmental vibration: Operate measurement survey according to the measurement method set by the Mongolian Standard. 3. Surveying Areas Areas affected by vibration of operation of the Metro. 4. Survey Locations Select 10 locations within survey locations affected by operation of the Metro. Use survey locations of F/S for reference. Survey location numbers may increase or decrease based on the content of the project plans. 5. Survey Period Once for one day (24 hours) on a weekday.	1. Estimation Items Estimate vibration from operation of the Metro. 2. Estimation Method Estimate the vibration by quoting and analyzing case studies. 3. Estimation Area Set as similar to “Survey Areas” 4. Estimation Location Select the estimation location that can adequately estimate the vibration from operation of the Metro within the estimation area. 5. Estimation Target Period The target period shall be the completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.
Ground Subsidence	(Before and during construction) - Ground subsidence by tunnels	1. Survey Items Ground subsidence conditions. 2. Basic Method of the Survey Collect and organize the documents and data relating to ground subsidence since shield tunneling method is planned and no large risk on ground subsidence is expected. 3. Survey Areas	1. Estimation Items Ground subsidence potential cause by the Metro construction 2. Estimation Method Cite reference cases or analyze possibility of ground subsidence 3. Estimation Area Set as similar to “Survey Areas”	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
		Select points from areas where tunnel and stations may impact environment geographically or geologically. Approximately 44 points are expected assuming 200 ~ 400m interval for the underground section, and 500m interval for the elevated section. 44 points x 2 seasons per year	4. Estimation Location Select the estimation locations that can adequately estimate the subsidence by the Metro construction within the estimation area. 5. Estimation Target Period The target period shall be the completion of the Metro facility.	capacity of the implementation body.
Offensive Odor	Not target of the survey.			
Sediment	Not target of the survey.			
Protection Area	Not target of the survey.			
Ecosystem	(Before and during construction and under operation) - Ecosystem in Botanical garden	1. Survey Items Impact on ecosystem by the Metro 2. Basic Method of the Survey - Literature review Main line and one candidate of train depot affect a part of the botanical garden owned by the National Science Academy. Study possible ecosystem impact through literature review. - Field survey Survey possible ecosystem impact through field survey.	1. Estimation Items Ecosystem impact on the botanical garden by one of the train depot options. 2. Estimation Method Assess possible ecosystem impact qualitatively based on the Metro plan 3. Estimation Area Set as similar to “Survey Areas”	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.
Hydrology	(Before and during construction and under operation) - River change caused by decrease of rainwater discharge accompanied with	1. Survey Items Changes of groundwater level or flow direction caused by water shielding in the underground section and groundwater pumping and pouring during construction. Water flow volume of rivers and flooding. 2. Basic Method of the Survey	1. Estimation Items Groundwater level change caused by water shielding in the underground section and groundwater pumping and pouring during construction. 2. Estimation Method Estimate groundwater level change quantitatively based on	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
	the Metro construction	- Literature review Find groundwater users in the area where the Metro tunnel may effect groundwater level (There is a part of the area where groundwater use is prohibited). Collect data of water flow volume of Tuul River, for both in summer (from June to August) and non-summer. Collect flooding history information to identify when and where flooding happened along the Metro line. Survey groundwater well usage and groundwater level. - Field survey Survey groundwater well usage and groundwater level via interview to the groundwater well owners along the Metro line. Survey groundwater level by boreholes. 3. Survey Areas Select points from areas where tunnel and stations may impact groundwater. Approximately 44 points are expected assuming 200 ~ 400m interval for the underground section, and 500m interval for the elevated section. 44 points x 2 seasons per year.	groundwater study, considering the Metro plan and geological condition. 3. Estimation Area Areas where water shielding in the underground section or groundwater pumping and pouring during construction may affect the groundwater level.	implementation body.
Topography and Geology	Not target of the survey.			
Ground Freezing	Not target of the survey.			
Climate Change	(During construction) - GHG emission increase caused by		1. Estimation Items Estimate GHG from operation of construction equipment or operation of vehicles to transport	

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
	construction equipment and vehicles.		materials and equipment. 2. Estimation Method Estimate quantitatively from vehicle numbers, etc. 3. Estimation Area All project target areas. 4. Estimation Target Period The peak period of construction.	
	(Under operation) - GHG emission changes caused by traffic decrease and higher travel speed due to the usage of the Metro facilities.		1. Estimation Items Estimate GHG from traffic decrease and higher travel speed due to the usage of the Metro facilities. 2. Estimation Method Estimate GHG according to Clean Development Mechanism (CDM) method. 3. Estimation Area All project target areas. 4. Estimation Target Period At completion of the Metro facilities.	
Involuntary Resettlement / Land Acquisition	(Before construction) - Resettlement of residents affected by construction.	1. Survey Items Area size and owners list of required land acquisition Population, the number of household and housing unit of involuntary resettlement 2. Basic Method of the Survey - Literature review Survey on land and building registration documents managed by Ulaanbaatar city government		- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
		- Field survey If involuntary resettlement is necessary, survey on the number of housing unit and household and population of involuntary resettlement which may not be precisely covered by official documents of Ulaanbaatar city government 3. Preparation of simplified "Resettlement Action Plan" Small number of involuntary resettlement is expected in this project. A simplified "Resettlement Action Plan (RAP)" which is necessary for JICA's supporting project will be prepared.		
Land Use	(Before and during construction) - Decrease of green spaces by constructing depot.	1. Survey Items Decrease of green spaces by constructing depot. 2. Basic Method of the Survey - Field survey Visit the candidate site of the depot to survey the green space. 3. Survey Area All project target areas.	1. Estimation Items Estimate the decrease of green spaces by constructing depot. 2. Estimation Method Estimate the influence of green spaces qualitatively by considering the distribution of depot and green spaces. 3. Estimation Area All project areas. 4. Estimation Target Period During period of construction.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.
	(Under operation) - Development along railroad and station area development.		Positive impacts from intensification of land use or economic revitalization are expected. This should be evaluated in the EIA for station area redevelopment but not for this Metro line project.	

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	**Effecting Factors**			
Public Health	(Before and during construction) - Influence by construction of laborer's lodges	1. Survey Items Condition of public health caused by laborers' accommodation. 2. Basic Method of the Survey - Literature review Collect and organize laws, documents and data relating to accommodation of laborers. - Interview survey Interview the laborers regarding awareness of public health. 3. Survey Area Laborer's accommodation and surroundings areas.		
Risks by Infections	Not target of the survey.			
Impact on Road Traffic	(Before and during construction) - Traffic congestion caused by construction vehicles and securing land for construction work (Under operation) - Decrease of traffic by operation of the Metro.	1. Survey Items Increase of traffic congestion caused by construction vehicles and securing of land for construction work. Decrease of traffic by operation of the Metro. 2. Basic Method of the Survey - Field survey Conduct traffic survey, if traffic conditions are different from this study. 3. Survey Points For case considered that traffic survey is necessary, select about 20 points assumed to be affected by road traffic. 5. Survey Period Field survey: One for one day (24 hours) on a weekday.	1. Estimation Items Conduct a future estimation of traffic. 2. Estimation Method Estimate the traffic volume by using JICA STRADA, etc. 3. Estimation Area Set as similar to "Survey Points" 4. Estimation Points Set as center of Ulaanbaatar city 5. Estimation Target Period The peak period of construction and at completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.
Impact on Users of Existing Public	(Before and during	Ditto.	Ditto.	Ditto.

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	**Effecting Factors**			
Transportation	construction) - Traffic increase caused by construction vehicles and securing of land for construction work. (Under operation) - Decrease in traffic by operation of the Metro.			
Impact on Operators of Existing Public Transportation	(Before and during construction) - Traffic increase caused by construction vehicles and ensure of land for construction work.	Ditto.	Ditto.	Ditto.
	(Under operation) - Re-organization of bus operation routes and staff reductions	1. Survey Items Changes caused by re-organization of bus routes and employees 2. Basic Method of the Survey - Literature review Collect documents and data on current conditions of bus operation and employees. - Interview survey Interview survey from bus and trolley-bus companies.	1. Estimation Items The number of employment from organization of trolleybus route other than Peace Avenue and feeder route connecting Peace Avenue and other areas. 2. Estimation Method Estimate personnel reduction caused by bus re-organization associated with the Metro construction plans. 3. Estimation Points Within project target area. 4. Estimation Target Period	

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
			During construction and at completion of the Metro facility.	
Dividing of Area	Not target of the survey.			
Sunshine Obstruction	(Under operation) - Possibility of sunshine obstruction on the north side of the elevated section.	1. Survey Items Condition of land use and topography. 2. Basic Method of the Survey - Literature review Collect and organize the related documents and data for land use and topography. - Field survey Conduct on-site survey accordingly to complement literature review. 3. Survey Area Areas that may possibly be affected by sunshine obstruction caused by the existence of the elevated structure.	1. Estimation Items Sunshine obstruction caused by existence of the elevated structure. 2. Estimation Method Estimate areas affected by the sunshine obstruction through sun shadow diagram. 3. Estimation Area Set as similar to “Survey Area” 4. Estimation Points Within estimation area, select the point most affected by sunshine obstruction caused by the existence of the elevated structure. 5. Estimation Target Period At completion of the Metro facility.	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.
Electromagnetic Interference	(Under operation) - Electromagnetic interference caused by the elevated structure.	1. Survey Items Condition of land use, topography, and electromagnetic reception. 2. Basic Method of the Survey - Literature review Condition of land use and topography: collect and organize the documents and data relating to land use and topography. Condition of electromagnetic reception: ascertain the location of TV tower, the direction of broadcasting	1. Estimation Items Electromagnetic interference caused by existence of the elevated structure. 2. Estimation Method Estimate the interference areas by calculation of electromagnetic interference caused by the elevated structure. 3. Estimation Area Set as similar to “Survey Area” 4. Estimation Points	- Consider the assessment and estimation results and environmental conservation measures, and evaluate if the pollutant is reduced or emitted as the maximum capacity of the implementation body.

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
		electromagnetic waves and the position of community reception facility. - Field survey Conduct measurement of image evaluation and electromagnetic wave strength using TV electromagnetic wave mobile monitoring station. 3. Survey Area Areas which may possibly be affected by electromagnetic interference caused by the existence of the elevated structure. 4. Survey Points Select about 5 points (towers) which are located on the north side of the elevated structure around TV towers. 5. Survey Period Once.	Within estimation area, select the point most affected by electromagnetic interference caused by the existence of the elevated structure. 5. Estimation Target Period At completion of the Metro facility.	
Heritage	(Before and during construction) - Displacement of heritage for construction	1. Survey Items Condition of main heritages 2. Basic Method of the Survey - Field Survey Literature review to check the location of heritage sites which would be affected by the Metro project. 3. Survey Points Select from areas where displacement of heritages is necessary to ensure property from the Metro facility and construction work spaces.	1. Estimation Items Disturbance to the heritages by construction of the Metro facility. 2. Estimation Method Evaluate the disturbance of the cultural heritage qualitatively. 3. Estimation Points Set as similar to “Survey Points”. 4. Estimation Target Period At completion of the Metro facility.	
Landscape	(Under operation) - Existence of the elevated structure and station facility	1. Survey Items Condition of main landscape. 2. Basic Method of the Survey	1. Estimation Items Disturbance of the landscape by the existence of the elevated structure and stations above	

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	**Effecting Factors**			
	above ground	- Literature review Collect and organize the documents and data relating to landscape. - Field survey Survey the landscape by taking photograph of the major prospect. 3. Survey Points Select about six points, with consideration of the location of the elevated structure and stations above ground. 4. Survey Period Once. Select an appropriate period within a year.	ground. 2. Estimation Method Estimate changes of scenery by using a photomontage method. 3. Estimation Points Set as similar to “Survey Points”. 4. Estimation Target Period At completion of the Metro facility.	
Poor, Ethnic Minorities and Indigenous People	Not target of the survey.			
Working Environment	(Before and during construction) - Consequences on working environment of construction workers.	1. Survey Items Laws and its operating condition relating to labor conditions. 2. Basic Method of the Survey - Literature review Collect the laws, documents and data relating to labor conditions, and organize information about any consequences on the working environment.		
Impact on Underground Facilities	Not target of the survey.			
Local Economy Such as Employment Opportunity and Means of Livelihood	(Before and during construction) - Impact of regional economy via employment by the Metro itself and bus	1. Survey Items Living environment and incomes of employees 2. Basic Method of the Survey - Literature review Collect and study laws, documents and	1. Estimation Items Growth of employment from expansion of trolleybus route other than Peace Avenue and re-scheduling of feeder route connecting Peace Avenue and	

EIA Items		Survey Methods	Prediction Methods	Assessment Methods
Environmental Elements	Effecting Factors			
	re-routing	data on living environment and incomes of employees in detail. - Interview survey Interview from employers of bus and trolley-bus operation.	other areas. 2. Estimation Method Estimate the number of employment from the Metro plan, and evaluate qualitatively by considering the decrease of labor by bus re-organization. 3. Estimation Points Within project target area. 4. Estimation Target Period During construction and at completion of the Metro facility.	
Other Impacts on Daily Life	Not target of the survey.			
Accidents	(Before and during construction) - Accidents during construction and during operation of construction vehicles (Under operation) - Accident of passengers and power failure		1. Estimation Items The number of construction vehicles and accident rates. 2. Estimation Method Evaluate qualitatively from the number of construction vehicles and accident rates from the Metro construction plan.	

Source: JICA Study Team

6.4.3 Draft TOR for Assessment Environmental and Social Consideration

Draft TOR for assessment is shown in this section to carry out DEIA after this study. According to the EIA law of Mongolia, a Mongolian research company licensed by the Ministry of Nature, Environment and Green Development can only conduct an EIA.

(1) Purpose

An assessment on each environmental and social impact shall be conducted according to instruction of the EIA law of Mongolia revised on 17th May, 2012 and the "Guidelines for Environmental and Social Considerations" by JICA. Based on the results of the survey, DEIA report shall be elaborated upon and necessary procedures for applications shall be implemented.

(2) Scope of Work

Scope of Work is as follows.

- Review this study report and other reports on environmental and social impacts in Ulaanbaatar, and make a draft survey implementation plan which determines environmental impacts and survey methods for each impact
- Implement a literature review, measurement survey and prediction for each impact, and summarize the results by each impact based on the survey implementation plan
- Prepare Environmental Management Plan
- Organize stakeholders meetings
- Prepare DEIA report and necessary documents for application procedures of EIA
- Implement a cumulative impact assessment

1) Preparation of Survey Implementation Plan

To review the final report of this "Preliminary Study on Urban Development Project in Ulaanbaatar City" and other environmental and social impacts related reports targeting in Ulaanbaatar, and prepare a draft survey implementation plan which determines environmental and social impacts and survey methods for each impact. The draft survey implementation plan shall include the following items.

(i) Survey contents (purpose, outline of the project, area of potential impact (survey area), and environmental impact).
(ii) Survey method, which includes measurement, prediction and evaluation methods for each environmental and social impact.
(iii) Survey schedule
(iv) Organization chart of the survey (contents of tasks, number of staff, responsible persons)
(v) List of literatures for the survey
(vi) Other necessary items

2) Conduct of Survey, Prediction and Evaluation

Survey, prediction and evaluation on each environmental and social impact during the project implementation shall be conducted based on the survey implementation plan. Survey items and points for the field survey will be set based on location, scale and local characteristics, etc.

3) Preparation of Environmental Management Plan

An Environmental Management Plan shall be made, which includes a series of countermeasures to eliminate, prevent and mitigate adverse impacts to affordable levels, monitoring and institutional enforcement during the Metro project implementation and operations.

4) Preparation and Operation of Explanation Meetings to the Public

In DEIA procedure, explanation meetings for the public shall be held to outline the draft scoping, survey and prediction methods for each environmental and social consideration impact and evaluation results to decision-makers, environmental NGOs and stakeholder residents (see Table 6.4.3). The meetings aim mainly for open discussions and opinion hearings. Measures to take opinions of affected, low-income and socially disadvantaged people must be prepared.

To make explanation materials on draft scoping and evaluation results, etc., prepare and operate the explanation meetings to the public, and make memorandums. Opinions submitted at the meetings shall be incorporated into DEIA if necessary. All materials shall be prepared in Mongolian and English.

Table 6.4.3 Purposes and Contents of Explanation Meetings to the Public

	Purpose	Content
1st	Explanation shall be conducted on the Metro project, survey contents, prediction and evaluation methods of environmental and social impacts for information sharing and open discussion.	・Explanation on the Metro project outline ・Necessity of transportation network ・Introduction of alternative options ・draft scoping for EIA implementation ・Open discussion
2nd	Evaluation results based on DEIA shall be explained for information sharing. Open discussion shall be held on the results of evaluation.	・Explanation for evaluation results and the draft environmental management plan (impact evaluation, mitigation measures, etc.) ・Open discussion

Source: JICA Study Team

(3) Preparation of Report

DEIA, which includes the scoping results, the survey results for each impact and results of the explanation meetings, shall be made. The following items shall be included in the report to satisfy the requirements of the Mongolian DEIA and "Guidelines for Environmental and Social Considerations" by JICA.

- Results of scoping for each environmental and social consideration impact
- Current environmental and social condition and data based on literature review and

field survey as baseline data
- Indicators on baselines and measurable performance targets
- Predicted results of environmental and social impacts (direct, cumulative and induced impacts)
- Environmental protection and mitigation measures (avoidance, minimization, compensation)
- Environmental management plan which contains mitigation plans on environmental impact, methodology and frequency of monitoring, cost, budget and implementation entity
- Resettlement Action Plan (RAP) if large negative impact occurs on involuntary resettlement and loss of livelihood.
- Public consultation, complaint procedure, contents of discussions at stakeholder meetings

Opinions from governmental authorities, Ulaanbaatar city, NGOs, the public and the other stakeholders, comments from business entities, peer review results by JICA on draft DEIA shall be introduced. Also, all comments from stakeholders shall be reflected in the final report.

(4) Applications on EIA

To Necessary procedures on EIA implementation for the Metro project must be conducted. Additionally, DEIA report must be submitted to the Ministry of Environment and Green Development of Mongolia, and “environmental clearance certificate” or its equivalent must be issued.

6.4.4 Procedures on Future EIA Implementation

Details of procedures for EIA implementation of the Metro project are shown in Figure 6.4.1. Details of application procedures for cumulative environmental assessment are shown in Figure 6.4.2. The implementing entity is not yet identified at present and Ulaanbaatar city assumes the responsibility.

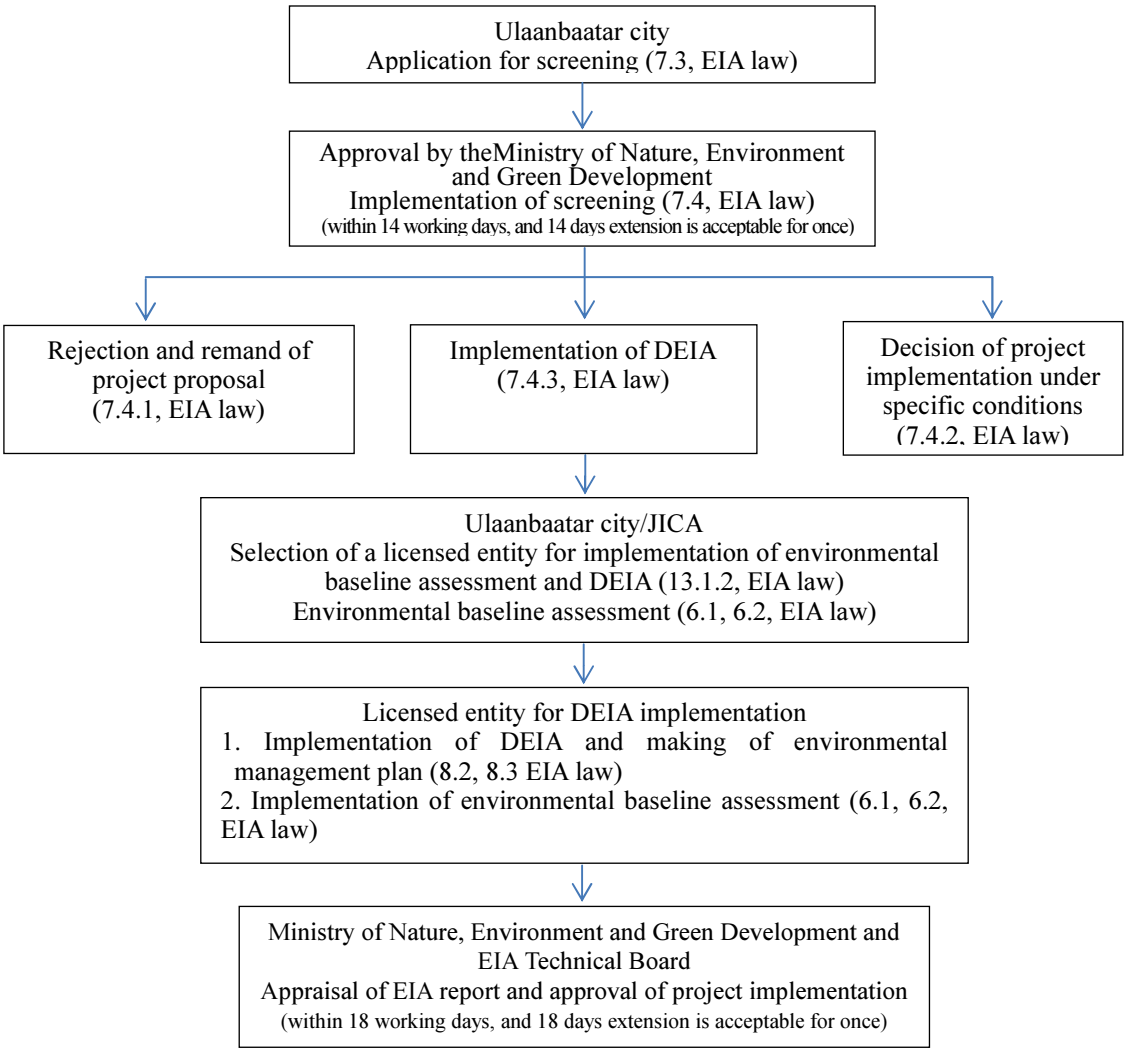


Figure 6.4.1 Procedures of EIA Implementation for the Project

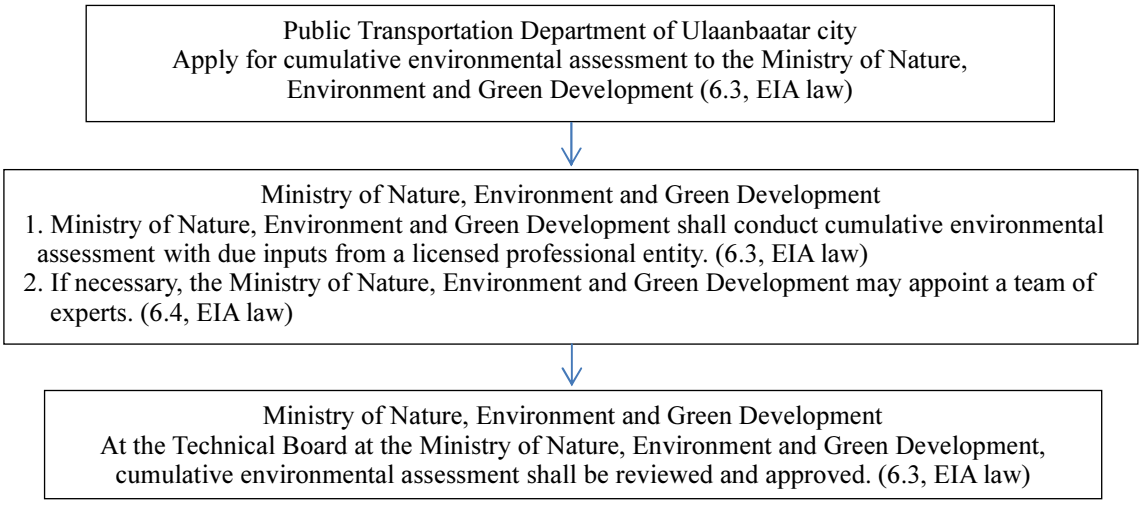


Figure 6.4.2 Implementation Flow of Cumulative Environmental Assessment

6.4.5 Development of Simplified "Resettlement Action Plan"

Since a small number of involuntary resettlement is expected in this Metro plan. Simplified "Resettlement Action Plan (RAP)" is to be developed according to JICA's "Guidelines for Environmental and Social Considerations". Simplified "Resettlement Action Plan (RAP)" must contain the following items:

1) Needs on land acquisition and involuntary resettlement
2) Analysis of legal framework on involuntary resettlement
3) Result of population census survey and property and land survey that covers all the occupants in the project sites
4) Result of household economy and lifestyle survey that covers 20% or more of all the occupants in the project sites
5) Requirements for beneficiaries of asset loss compensation and life reconstruction measures
6) Procedures for asset loss compensation according to reacquisition cost, based on reacquisition cost survey
7) Life reconstruction measures which improve (or restore in minimum) beneficiaries' household economy and living standard compared with the pre-resettlement status, based on life reconstruction needs survey
8) Responsibility of organization which handles complaint and procedure of complaint handling
9) Identification of organization (executing organization, local government, consultant, NGO, etc.) having responsibility for involuntary resettlement and their responsibilities
10) Implementation schedule to start physical resettlement after the completion of the asset loss compensation payment
11) Cost and its funding
12) Monitoring system and form used by the executing organization
13) Report of discussions with residents on project initial design and alternative plans for life reconstruction measures

6.5 Potential for Clean Development Mechanism (CDM)

6.5.1 Framework for Green House Gas (GHG) Mitigation in Mongolia

Mongolia ratified the followings internationally for GHG mitigation.

- United Nations Framework Convention on Climate Change (1993)
- Kyoto Protocol (1999)
- Energy Charter Treaty (1999)

For GHG emission mitigation, Mongolia prepared and updated the following frameworks. It is noteworthy that GHG emission mitigation is defined in the air pollution law.

<Laws>

- Renewable Energy Law (2007)
- Law on Air (2012)
- Law on Air Pollution Payment (2012)

<Long-term sustainable development programs>

- The Mongolian Action Program for the 21st Century (MAP21)(1998)
- The MDG-based Comprehensive National Development Strategy of Mongolia (2008)

<Mid-term programs>

- National Action Program on Climate Change (2011)
- National Renewable Energy Program (2005)
- New Reconstruction Mid-term (development) Program (2010)

Mongolia carried out the following studies and reports, partially in cooperation with the United Nations Environment Programme (UNEP), World Bank and Institute for Global Environmental Strategies (IGES).

- Mongolia Second National Communication (2010)
- Carbon Finance in Mongolia (2011)
- Market Mechanism Country Fact Sheet: Mongolia (2011)
- Japan-Mongolia Joint Statement on Environmental Cooperation, Climate Change and the Joint Crediting Mechanism (2012)

The framework for global warming mitigation and CDM project support has been developed in Mongolia.

6.5.2 CDM Project in Mongolia

From Table 6.5.1 to Table 6.5.4 show CDM projects in Mongolia. All the projects are related to renewable energy or energy efficiency. There is no project related to transportation.

Table 6.5.1 Registered Projects from Mongolia

Category	Project Name	Current state	Project participant	Annual emission reduction proposed
Renewable Energy	12MW Durgun Hydropower project in Mongolia	Registered. 14468 CERs issued for the monitoring period of Nov. 2008 to May 2010	Japan	30400 ton CO_2-eq
	12MW Taishir Hydropower project in Mongolia	Registered. Total 838 CERs issued for monitoring period between Nov.2008 to May 2010	Japan	29600 ton CO_2-eq
Energy Efficiency	A Retrofit program for decentralized heating stations in Mongolia	Practically dead		12000 ton CO_2-eq

Source: CDM National Bureau (2012)

Table 6.5.2 Approved and not- Registered Projects from CDM DNA

Category	Project Name	Current state	Project participant	Annual emission reduction proposed
Renewable Energy	Salkhit Wind Farm	PDD drafted, At validation stage. (Reissuance of LoA on 11th November 2011)		180000 ton CO2-eq Profile 10-07-28
	Maikhan small hydropower project in Mongolia (12MW)	PDD drafted. Looking for finance.		36377 ton CO2-eq Profile 10-07-28
	Pellet and briquette plant in Mongolia	PDD developed. ERPA signed.	Germany	19436 ton CO2-eq

Source: CDM National Bureau (2012)

Table 6.5.3 Endorsed Projects from CDM DNA

Project Name	Date of Endorsement / No Objection	Annual emission reduction proposed	Current State
Building Energy Efficiency MON/09/301 Project	2011.01.07	63,000 ton CO_2-eq	PIN
Project of generating energy from garbage treatment	2010.10.01	459,000 ton CO_2-eq	PIN
Energy conservation and emission reduction from poor households	2010.04.08	75~90,000 ton CO_2-eq	PDD drafting
Community based heating supply in rural remote areas of Mongolia	2010.02.18	17~23,000 ton CO_2-eq	PDD
Sainshand wind farm project	2010.01.18	174,000 ton CO_2-eq	PIN
Biogas Plant Project in Mongolia	2010.01.18	2,312 ton CO_2-eq	PIN
WGGE-waste gas to green energy	2009.11.24	28,500 ton CO_2-eq	PDD drafting
Oyu tolgoi wind power project (250MW Khanbogd high power wind farm)	2009.11.19	1,412 ton CO_2-eq	PDD drafting Profile 10-07-28
Replacement of coal and wood fired heating by renewable heating system	2009.09.18	15,445 ton CO_2-eq	PIN
Reconstruction boilers in Power Plants of Darkhan and Erdenet cities	2009.09.18	32~33,000 ton CO_2-eq	PIN
Energy efficiency rehabilitation for pre-cast panel buildings	2009.09.18	100~110,000 ton CO_2-eq	PDD drafting

Source: CDM National Bureau (2012)

Table 6.5.4 Prior Consideration of the CDM

Project Name	Entity Name	Host Party	Date Received
Choir Wind Farm Project	Aydiner Global LLC	Mongolia	7 Apr 2011
Energy and coal saving for ger households in Ulaanbaatar, Capital City of Mongolia	Energy Authority, Ministry of Mineral Resources and Energy	Mongolia	2 Dec 2010
Waste Gas To Energy Darkhan	Sharyngol Energy LLC	Mongolia	8 Nov 2010
Pellet briquette plant in Mongolia	NTIC Co., LTD	Mongolia	23 Jun 2010
Community based Heating Supply in Rural Remote Areas of Mongolia	Ministry of Mineral Resources & Energy	Mongolia	20 Jan 2009

Source: CDM National Bureau (2012)

6.5.3 Mass Rapid Transit (MRT) Projects Registered in the World

ACM 0016 is the approved consolidated baseline and monitoring methodology for Mass Rapid Transit (MRT) projects. Table 6.5.5 shows all the registered projects in the world.

Table 6.5.5 Registered Projects in MRT Projects

Category	Project Name	Current state	Project participant	Annual emission reduction proposed
Mass Rapid Transit Projects	BRT Lines 1-5 EDOMEX, Mexico	Registered on 30, May, 2011	Mexico, Swiss	157,336 ton CO_2-eq
	Metro Delhi, India	Registered on 30, June, 2011	India, Swiss	569,956 ton CO_2-eq
	BRT Metrobus Insurgentes, Mexico	Registered on 10, August, 2011	Mexico, Spain	45,976 ton CO_2-eq
	Mumbai Metro One, India	Registered on 4, October, 2011	India, Swiss	195,386 ton CO_2-eq

Source: IGES CDM Project Database (Version 1st, Nov. 2012)

6.5.4 GHG Emission Reduction Potential and its Credit Potential

This Study calculated GHG emission reduction potential and its credit potential, in order to evaluate the Metro Project for global warming mitigation, and to estimate the funding potential via a clean development mechanism. The calculation conditions are shown in Table 6.5.6. The GHG emission reduction potential and its credit potential are shown in Table 6.5.7.

The GHG emission reduction potential in 2020 is 39 CO_2 (1,000 ton/year), calculated as 2,304 – 2,199 – 66. This reduction potential is equal to 2% of GHG total emission from transportation in Mongolia in 2006 (1,887,000 CO_2-ton/year). This potential is significant for Mongolia, since it is the second large potential in the registered or approved CDM projects in Mongolia (Table 6.5.1 and Table 6.5.2). However, this potential is smaller than any MRT project registered (Table 6.5.5).

The GHG emission reduction potential in 2020 is equivalent to a 160,697 EUR/year credit. Assuming that the credit will be approved for 21 years from 2020 to 2040, the total emission reduction potential will be 706 CO_2 (1,000 ton/year), and the total credit will be 2,881,932 EUR[18].

Vehicle NOx emission, which makes roadside air quality above standards, is shown in Table 6.5.8. The NOx emission reduction potential is up to 1,754 (ton/year), calculated as 25,053 – 23,299. It is a 6 to 7% reduction to baseline emissions.

Table 6.5.6 Calculation Condition of GHG Emission Reduction Potential

Parameter	Condition
GHG Substance	CO_2
Baseline and Project Cases	Traffics allocated by the traffic simulation model of this study 1. Baseline case is "Do Max Case (without vehicle transit, without mass transit)" 2. Project case is "Do Max Case (without vehicle transit, with mass transit)"
Boundary	Traffic model boundary allocated in JICA STRADA (version 3) software by this study, which is almost equal to the whole of Ulaanbaatar City.
Traffic volume	Traffic allocated by the traffic simulation model by this study
Emission Factor	1. The Emission factor for Heavy Duty Bus is derived from "Capacity Development Project for Air Pollution Control in Ulaanbaatar City" project of Ulaanbaatar City and JICA. 2. Power consumption is calculated by this study 3. Grid Emission Factor is the OM value (1.1501CO2-ton/MWh) announced in http://www.cdm-mongolia.com/
Market Price of Certified Emission Reduction	The price of BlueNext sport market on 5th, June, 2012 (4.08 EUR/ton-CO2)
Money Exchange Rate	T.T.S. MITSUBISHI-UFJ, 4, Dec, 2012 (108.84 Yen/EUR)

Source: JICA Study Team

Table 6.5.7 GHG Emission Reduction Potential and Credit Equivalent (1,000 CO2-ton/Year)

Cases	2010	2020, Do Max without Vehicle Transit		2030, Do Max without Vehicle Transit	
	Current	Baseline	Project	Baseline	Project
CO_2 Emission (1,000 CO_2-ton/Year) by Vehicle	591	2,304	2,199	3,530	3,396
Power Consumption by the Metro	0	0	57,321	0	88,000
CO_2 Emission (1,000 CO_2-ton/Year) by the Metro	0	0	66	0	101
CO_2 Emission Reduction Potential (1,000 CO_2-ton/Year)	-	-	39	-	34
Credit (EURO/Year)	-	-	160,697	-	137,235
Credit (JPY/Year)	-	-	17,490,260	-	14,936,643

Note: Market price of GHG emission： BlueNext sport market, 5 June 2012 (4.08 EUR/ton-CO2)
Exchange rate：T.T.S. MITSUBISHI-UFJ, 4, Dec, 2012 (108.84 Yen/EUR)
Source: JICA Study Team

[18] Yearly emission reduction potential is calculated by a linear interpolation of emission reduction potential of 2020 and 2030.

Table 6.5.8 NOx Emission (ton/Year)

Cases	2010	2020, Do Max without Vehicle Transit		2030, Do Max without Vehicle Transit	
	Current	Baseline	Project	Baseline	Project
NOx Emission (NOx-ton/Year)	5,370	17,564	16,424	25,053	23,299
NOx Emission Reduction Potential (NOx-ton/Year)	-	-	1,140	-	1,754

Source: JICA Study Team

6.5.5 Issues for Credit Development

Issues for credit development via clean development mechanisms are identified as follows:

(1) Application of ACM 0016 (Ver. 3.0.0)

In order to apply a CDM project, GHG reduction potential is to be calculated by a CDM Methodology. The only approved consolidated baseline and monitoring methodology for MRT projects is ACM 0016 (Ver. 3.0.0). This methodology is different from the emission reduction potential calculation above in the following ways:

a) Spatial extent of the project boundary: the emission reduction calculation above is calculated based on traffic data of the whole of Ulaanbaatar city. In the methodology of ACM 0016, it should be calculated only for the roads with large traffic volume inside a radius of minimum 1 kilometer running parallel to the MRT line.
b) Emission Factor is referred to that estimated by other countries. It should be substituted with Mongolian authorized data.

(2) Monitoring

At the monitoring stage, the GHG emission inside the spatial extent of the project boundary should be correctly calculated, and the baseline emission—that is the estimated emission if MRT is not developed—should be correctly estimated. Traffic and fuel consumption ratio will be necessary to be surveyed. These without the Metro will be estimated by necessity.

(3) CDM Registration Procedure

CDM requires "additionality," that is, to ensure the project will be feasible by the credit of which amount is uncertain at the planning stage. The project registration requires one and half years on average, which includes validation processes by a third party agency, United Nations Framework Convention on Climate Change (UNFCCC), and the CDM Executive Board. The carbon credit amount will be determined after the project is started and GHG emission reduction is verified. All the processes require a long time and costs. There are many uncertainties until the profit from sale of the credit is generated.

A strong support both by Mongolia and Japan is required in order to apply the Approved

Consolidated Methodology (ACM) 0016 (Ver. 3.0.0) and to monitor the project.

a) Active support by CDM-related organizations of Mongolia (i.e. To append Mass Transit Project into "Nationally appropriate mitigation actions of developing country Parties (NAMA)")
b) Active support on collecting activity data and developing emission factors (i.e. traffic survey, fuel consumption rate survey, traffic model application), and their quick approval.

In order to avoid the uncertainty risk of the CDM processes, it may important to apply the Bilateral Offset Credit Mechanism (BOCM) instead. This mechanism is planned to be flexible and tailored to the circumstances of the countries concerned. CDM's additionality issue is planned to be overcome by alternative standards, such as positive lists which is not adopted in the Business as Usual (BAU) of the project country.

On December 6th, 2012, Mr. Hiroyuki Nagahama (the Minister of the Environment, Japan) and Ms. Sanjaasuren Oyun (Minister of Environment and Green Development, Mongolia) signed the "Joint Statement by Minister for the Environment of Japan and Minister for Environment and Green Development of Mongolia on Environmental Cooperation, Climate Change and the Joint Crediting Mechanism". Article 5 declared: "The two Ministers confirmed mutual recognition on starting operation of the Joint Crediting Mechanism by early 2013 and affirmed that both sides will concur on the bilateral document as soon as possible."

Because the GHG emission reduction potential of this Metro project is much larger than the other CDM project registered, the project has a great contribution potential to the mitigation of global warming. However, this project may not meet with the additionality definition of the CDM framework because the project may be introduced without CDM credit. The emission reduction potential and feasibility should be studied by the new alternative mechanism: the "BOCM."

Boxed Article: Bilateral Offset Credit Mechanism (BOCM)

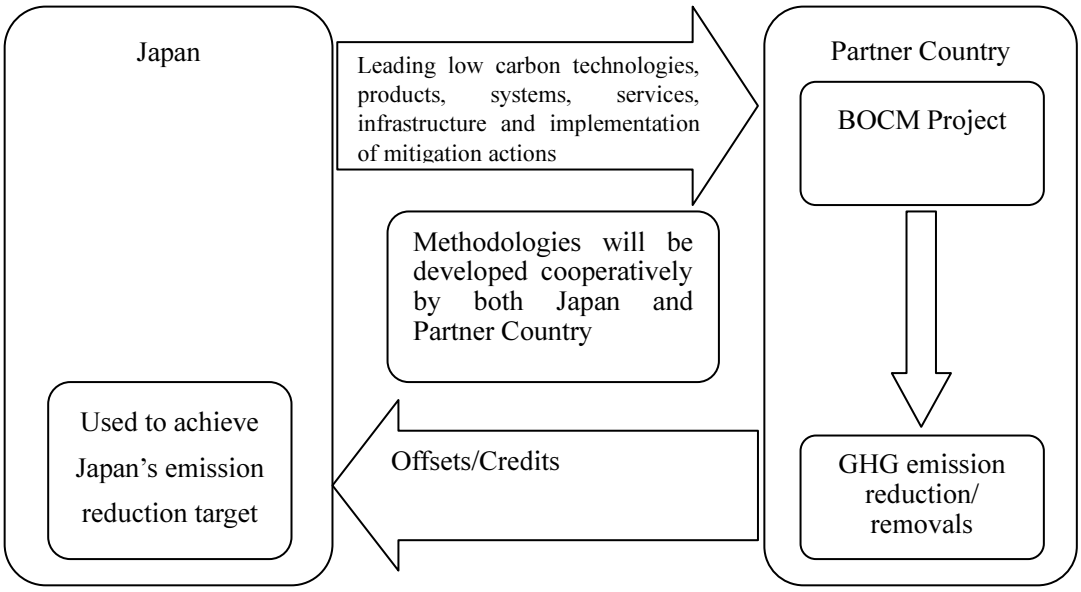
CDM is a mechanism to financially support GHG emission reduction/removal projects. However, because the mechanism is not simple, CDM is not easy to be applied to countries and categories of which statistics, human resources or budgets are not enough for GHG emission reduction estimation and validation. Because the GHG emission reduction will be validated after project operations, GHG reduction credit is not possible to be granted at the project planning stage. Budgets, validation costs and time is necessary until the credit is certified. Because of these difficulties, only 3 projects have been registered from Mongolia and one of these projects is in "Practically Dead" status (Table 6.5.1).

There are many potential GHG emission reduction/removal methods which do not satisfy CDM requirements. In order to promote GHG emission reduction/removal widely, the Japanese Government proposed BOCM. They are designing it and discussing about it with countries such

as Mongolia, to start in 2013.

The purposes of BOCM are mentioned as follows:

- To facilitate diffusion of leading low carbon technologies, products, systems, services, and infrastructures as well as the implementation of mitigation actions, and contributing to sustainable development of developing countries.
- To appropriately evaluate contributions to GHG emission reduction or removal from developed countries in a quantitative manner, through mitigation actions implemented in developing countries and use those emission reductions or removals to achieve emission reduction targets of the developed countries.
- To contribute to the ultimate objective of the UNFCCC by facilitating global actions for emission reductions or removals.



Source: Website of Ministry of Environment, Japan
(http://www.mmechanisms.org/document/120919-BOCM_MOEJ.pdf, in Japanese)

On 8th January 2013, in Ulaanbaatar, Mr. SHIMIZU Takenori (Ambassador Extraordinary and Plenipotentiary of Japan to Mongolia) and Ms. Sanjaasuren OYUN (Minister of Environment and Green Development of Mongolia) signed bilateral partnership on BOCM (http://www.env.go.jp/press/file_view.php?serial=21354&hou_id=16174). Its title is "Low Carbon Development Partnership between Japan and Mongolia", which contains articles to facilitate financial, technological and capacity building support necessary for the implementation of BOCM, to transform to the tradable credit type mechanism, and to consider possible extension of the partnership.

BOCM is planned to cover GHG emission reduction/removal projects widely. It has higher possibility to be applied for The Ulaanbaatar Metro Project. Assuming that the construction

will be in 2013 and the operation will start in 2021, GHG emission reduction can be validated in 2022 or later. In this case, some issues in applying BOCM are as follows:

(1) Financial Source of Project

"Financial" mentioned in Article 8 is for BOCM implementation rather than for the project itself. If the GHG emission validation system of BOCM is similar to that of CDM, credit value cannot be validated until 2022. It is longer until the investor will get credit. Public sector finance or any alternative mechanism to encourage private sector finance is necessary.

(2) Credit Trade

BOCM "starts its operation as the non-tradable credit type mechanism" (Article 9). However, entities that can fund the project (financial entities mainly) are generally not equal to the entities that require credit (energy consumption entities mainly). It is therefore necessary to convert the mechanism to tradable credit type in order to find investors in BOCM scheme.

(3) Period

"This partnership covers the period until a possible coming into effect of a new international framework under the Convention" (Article 11). Since the new international framework might start from 2021, this partnership may no longer be active when the Metro's GHG emission reduction will be validated from 2022. "Extension of this partnership" (Article 11) or alternative mechanism modification is necessary.

7 Public-Private Partnership (PPP) Implementation Scheme

7. Public-Private Partnership (PPP) Implementation Scheme

With regard to the implementation scheme of the Ulaanbaatar Metro (UB Metro), there are basically three types of schemes: the public work scheme, the Public-Private Partnership (PPP), and the hybrid public company scheme. According to the Railway Law of Mongolia, a two-tiered system is a basic structure of railway business.

On the assumption of a PPP implementation scheme, the following two schemes are possible:

(1) A special purpose company (SPC) scheme: SPC operates the Metro based on the two-tiered system; and

(2) A public company scheme: A public company by the joint-investment of the public and the private sectors operates the Metro based on the two-tiered system.

This chapter examines the optimal implementation scheme for the UB Metro based on the funding and management aspects.

7.1. PPP-Related Legal System, Licenses and Permissions in Mongolia

This section provides key issues regarding the legal system, licenses and permissions for both the SPC scheme and the public company scheme.

7.1.1. SPC (Concession Project) Scheme

If the UB Metro project is implemented under the SPC scheme as a concession project, it is expected that it will be a concession project under the Law on Concession enacted in January 2010 (amended in August and December in 2012) as long as it is included in the concession list.

It is desirable that the agreement is guaranteed by the central government when Ulaanbaatar City is a party of the agreement: (1) a loan guarantee as stated in Article 30.1.1; (2) provision of a portion of financing in Article 30.1.2; (3) guarantee of the minimum amount of the concessionaire's revenues under the concession agreement in Article 30.1.5; and (4) the Viability Gap Funding (VGF) in Article 30.3.Considering the implementation of this Metro project, an entity that submits a proposal for inclusion in the list should be determined.

The study team is considering an implementation scheme on the assumption of the adoption of the "Two-tiered System." In this case, it is assumed that Ulaanbaatar (UB) City (or national government) will develop the infrastructure, such as tunnels, elevated structures, railroad tracks, stations and power plants as public works, with financial assistance from foreign countries granted to the government, including ODA. Accordingly, the government will be the owner of the infrastructure according to the Railway Law and lease it to concessionaires under a long-term agreement. The concessionaires are supposed to develop, purchase or construct the rolling stock (owned or leased), and related facilities, and own them. After that, they begin to operate the urban public transportation system, which forms a part of this project. If the concession item is the infrastructure, its owner will be the government, which means that the entity that submits the list is the government (Ministry of Roads and Transportations: MRT)—in accordance with Articles 7.1 and 9.4. In this case, the government (MRT) invites tenders for the Project according to Article 6.2.8 as applied in Article 7.1. In addition, the government is supposed to conclude the concession agreement according to Article 6.2.9.

However, as Article 3.1.7 defines "authorized entity," it has not yet been discussed who would own the Metro: is it the central government or Ulaanbaatar City? Thus, it is important to make clear the entity with which to negotiate, the central government (the ministry in charge) or Ulaanbaatar City. Specifically, it is necessary to confirm which body is the entity to submit the list, invite tenders, and conclude the agreement when the proposal is submitted. Generally,

Mongolian stakeholders recognize that it is appropriate to choose the concession of the government not UB City from the viewpoint of the project scale and hence it is highly possible that the government will be the entity that submits the list[1].

When an entity submits an unsolicited proposal for this project, it must follow the procedure specified in Article 18. Even if the proposed project is adopted, it is to be tendered. However, according to Article 18.6, if several entities participate in the tender, the original proponent is given some preference in the process of evaluating the proposals and such preference is to be included in the tender documents.

Article 3.1.6 states that the state regulatory authority grants the permission and licenses, determines the price and tariffs, and also adopts and enforces regulations. The state regulatory authority is thought to be MRT but UB City is in charge of the operation of the Metro such as the determination of the price and tariffs. In particular, a method to determine the price and tariffs is a key issue and Article 21.1.3 specifies that it should be included in the concession agreement.

Other necessary agreements in addition to the concession agreement are: (1) agreements between share holders and (2) contracts between the operator and contractors (contracts for design, construction, maintenance and operation) and so on. Besides, in the case of project finance loans, (3) loan agreements between the operator and lenders, (4) mortage agreements regarding assets owned by the operetor and stocks owned by share holders and (5) a direct agreement between the government or UB City and the operator are necessary.

In relation to the concession law, in order to implement this Metro project it is assumed that additional permissions and licenses from relevant governmental organizations are necessary based on the laws and regulations. The following are laws relevant to this project: (1) the Law on Land Use and other related regulations for the infrastructure development; (2) the Commercial Code, the Company Law, the Foreign Investment Law, the Tax Law and other related regulations for investment and business; and (3) the Railway Transportation Law and other related regulations for the public transportation services and the railway business. Concessionaires should be granted necessary permissions and licenses based on the relevant laws. Thus, when implementing this project, it is necessary to examine whether there is any permission or license to be given on the basis of the above laws. With regard to the rail transport services, the Railway Transportation Law regulates the following matters: 1) construction and use of the foundation structure; 2) generation, assembly and repair of the foundation and the system and rolling stock; and 3) special permission for the railway transport services (Article 16). Therefore, the study team needs to consider if the permission is required (refer to Chapter 8 as for the special permissions).

In addition to the permissions and licenses based on the laws and regulations, it is presumed that the government may be involved in the implementation of the project based on the contract. For instance, such matters as obtaining the right to develop the vicinities of railway stations using the SPC, provision of subsidies by the government and request for compensation for business may be conducted on the basis of contract with the government.

When the Metro project is implemented based on the concession law, it is necessary to make a decision taking into consieration which type of concessions is adopted and if the target area is not a strategic area of the government.

7.1.2. Public Company Scheme

Some people stated that even with a public company established for the Metro project, as long as the private sector invests in the company, the project shall be implemented under the concession law. However, others mentioned the possibility that, in case of a lower share of the

[1] From the interview with a former staff of MRT

private sector, the concession law is not applied.[2] If the concession law is applied, the same process and agreements explained in the previous subsection are needed. However, the concession law does not clearly stipulate conditions under which the joint investment public company must follow the concession law. Therefore, the procedure of the metro project must be based on the decision of concerned organizations (in this case, the Ministry of Economic Development, which is in charge of the concession law).

In addition, the process of the establishment of the public company depends on which is the main body, the national government or the UB city, and the process in case of the national government and the UB city must be clarified. It is appropriate that UB City is responsible for the operation of the railway since beneficiaries of the Metro are citizens of UB City only. When it comes to the public company, according to discussions with MRT, there are no legal problems with the establishment of Joint Venture (JV) of three parties: the government, UB City and private companies. The JV is supposed to be established based on the company law. It has also been clarified[3] that the operation of the UB Metro by the JV composed of the public and private sector does not violate the railway transportation law.

However, the Ministry of Economic Development expressed their opinion that the share of the JV parties is a key issue to be examined later. Consequently, regarding the possibility of the investment by both the government and UB City and the ratio of the private investment, details should continue to be considered through discussion with the Mongolian side after this feasibility study.

In addition, in case that the private companies are main investors of the public company, the operation is expected to be based on the economic rationality. but it is not justified to seek the guarantee of a public aspect of the UB Metro (public financial responsibility to the sustainable operation). On the contrary, in case that the public consisting of mainly UB City is the majority of the public company, inefficiency in the operation including financing and decision-making process may not be avoided. This is probably the biggest constraint for the private investors.

When it comes to whether the public company scheme is adopted or not, the following matters should be considered: (1) whether or not, and how much the government and the UB City are able to make an investment in the public company from the political and financial viewpoints, and (2) whether agreements related to the subcontracting and procurement between the private investors and the public company is not forbidden by Mongolian laws and regulations in relation to the procurement. In particular, (2) is an important condition for private companies to decide the capital participation of the public company.

7.2. PPP Scheme

As for the implementation scheme of the UB Metro, the two-tiered system (the government will be the infrastructure owner) should be chosen since the railway transportation law specifies that the infrastructure shall be owned by the government. The fare revenue is not enough to pay back the investment and therefore the two-tiered system of the separation of the infrastructure owner and the operator should be examined from the viewpoint of the cost of investment.

Another rational reason to choose the two-tiered system is a financial aspect. Financial profitability of the metro project is analyzed in Chapter 10. The financial analysis examines two cases: (1) with ODA soft loan (40% of the total cost) and (2) without ODA soft loan. According to the result, Project Internal Rate of Return (PIRR) is around 2% on the assumption that the ODA loan is utilized and average fare is MNT 600. This shows that it is not realistic for one operating company to pay back the investment of the infrastructure with only fare revenue and

[2] From the interview with the Ministry of Economic Development and UB city mayor.
[3] From the interview with a former staff of MRT

implement a sustainable operation and management. The infrastructure should be paid back in a long term as public goods from the economic point of view. An operation scheme clearly different from the SPC management which provides comfortable metro service on the commercial basis is required.

The following three operation schemes are considered by the degree of involvement of the public sector:

(i) Two-tiered private management PPP scheme (100% privately owned)

(ii) Two-tiered joint investment PPP scheme (Over 51% owned by the public)

(iii) Two-tiered public management scheme (100% owned by the public)

As mentioned above, regarding the validity of the investment ratio, further discussions between concerned agencies are necessary. The government of Mongolia has clear policies which say that "the government shall provide the public transport services with responsibility" and "the UB Metro is the first urban mass transit system in Mongolia and the know-how from the private sector will be utilized to improve the inefficiency of the public services (e.g. power industry)." Therefore, the study team proposes to choose (ii) above, a two-tiered joint investment PPP scheme. and a "Public Corporation" scheme in which the public does mainly the operation. The private sector will be strategic partners[4] whose roles are to invest in the company and to provide their management know-how.

7.3. Optimal PPP Scheme for the UB Metro

The urban railway business is not simple and has many issues to be considered such as the policy formulation, technical standards, economic regulations, the approval of fare rates, safety management, drivers' licenses, maintenance of railroad tracks, railway management, asset management, and the cooperation and competition with bus operations. The division of roles among stakeholders, namely, the government, other governmental agencies, Ulaanbaatar city, bus companies, the private sector, should be clarified considering the following points.

- The basic division of roles between the government and Ulaanbaatar city is that the government constructs and owns the infrastructure and Ulaanbaatar city procures Electrical and Mechanical (E&M) equipment and operates the metro.
- It is necessary to make clear the roles of the private sector in the above framework.

On the above premise, this study proposes details of (ii) a two-tiered joint investment PPP scheme (over 51% owned by the public). In the proposal, detailed plans will also be developed, considering the rough sharing plan of financing the project based on the amount of the investment cost and the result of analysis for profitability. The following points should be noted in the establishment of the implementation scheme.

(i) Whether the scheme matches national policy intentions, and roles and capacity of the relevant organizations in Mongolia.

(ii) Whether the scheme optimizes know-how from the private sector, brings benefits to both the public and private sectors, and has sufficient motivation to implement the metro project.

(iii) Whether the scheme matches the capacities to bear the large project cost and implement the project including human resources of the Mongolian side.

[4] There are many projects with the strategic partners such as the Light Railway Transit (LRT) Project in France and the Beijing International Airport Project in China.

(iv) Whether the scheme has an appropriate framework and conditions for the investment participation to attract the private investors from inside Mongolia as well as overseas.

Figure 7.3.1 shows a proposed two-tiered PPP scheme of the metro project based on the above. The next section explains details of a financing scheme but this figure describes the mutual relationship between a body which constructs and owns the infrastructure (national government) and a body which obtains the concession of the infrastructure, procures rolling stock and related facilities, and operates the metro (SPC).

Specifically, the Ulaanbaatar Metro Corporation (UBMC) is established as an operator of the metro and operates with the assistance of the private strategic partners. UBMC pays a flat rate of infra-rent fee to the national government every year and the government, in turn, provides the necessary support for the operation of the public transport system such as a guarantee to UBMC.

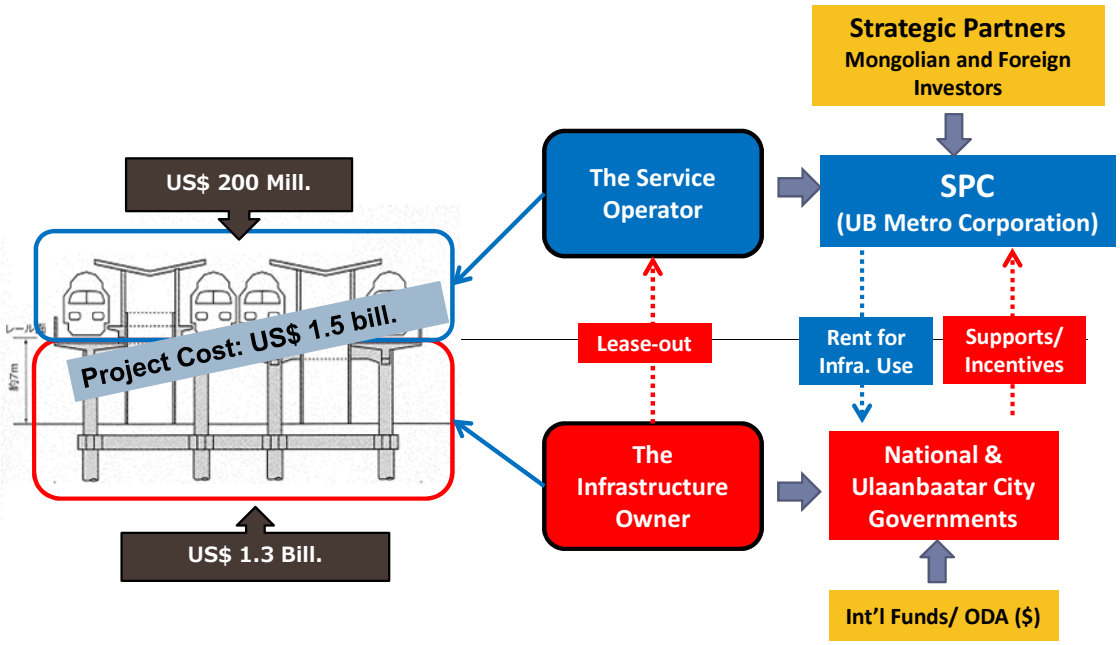


Figure 7.3.1 A Proposed Two-Tiered PPP Scheme for the UB Metro

7.4. Financing Scheme and Source of Fund

7.4.1. Financing Policy

On the assumption of the public corporation scheme proposed in the previous section, a financing plan is prepared on the basis of the following policy. The basic policy is that the government of Mongolia is responsible for the financing because the UB Metro is a public transport service provided by the government. The initial investment is US$1.5 billion (2 trillion MNT) and this cost is divided into two parts: (i) US$1.3 billion is for the fundamental structures (infrastructure portion) specified in the railway transportation law and (ii) US$200 million is for rolling stock and related systems. The financing scheme is also separately examined for each part.

(1) Construction Cost of Infrastructure

The starting point is that the UB Metro project must be approved as a national strategic project and granted the highest implementation priority. The Ulaanbaatar city master plan was formulated in cooperation with Japan and the UB Metro project was proposed as a strategic project for the formation of a compact city in the master plan. Therefore, Japanese ODA fund, which is a long-term loan with a low interest rate, should be incorporated in the financing scheme, and bilateral technical assistance from Japan will be also provided. This brings about material and immaterial collaboration with partners from Japan. In addition, the budget from the government of Mongolia must be secured as a counterpart fund in order to receive the Japanese ODA fund. In this regard, the following are considered:

(i) The construction of the infrastructure is implemented as a project for the development of public facilities with the assistance of ODA funds. In this case, over 51% of the construction cost is expected to be covered by the Mongolian government and the rest is financed by ODA.

(ii) The owner of the project is the minister of the Ministry of Roads and Transportation (MRT) in terms of the budget inclusion and funding. Thus, the budgeting for the UB Metro must follow the budgeting process of MRT.

(iii) A government special fund (e.g. Human Development Fund) based on the revenue from the mining industry is proactively utilized.

(iv) Funding from the international capital markets (issuance of the government guarantee bond of the bank of Mongolia) based on the potential of the future revenue from the mining industry is optimized.

(v) Funding from the capital markets with credibility increased by the Japanese government support system (e.g. funding by issuance of samurai bonds with a JBIC guarantee).

To illustrate the possibility of securing the above mentioned government funding, there is an estimate of potential impact to the government revenue in the future which Tavan Tolgoi (TT) and Oyu Tolgoi (OT) would have, and which has been prepared in cooperation with the Frontier Securities of Mongolia (see Table 7.4.1). As widely known, the impact of the interest from the mineral resources development on the improvement of the national finance is greatly expected. However, there are some risks such as the international market price (especially to China) and political risk, and therefore it is difficult to forecast the impact in the long run. This analysis assumed a pessimistic scenario (Scenario 1) and an optimistic scenario (Scenario 2) and the most probable baseline scenario between the pessimistic and the optimistic was forecasted.

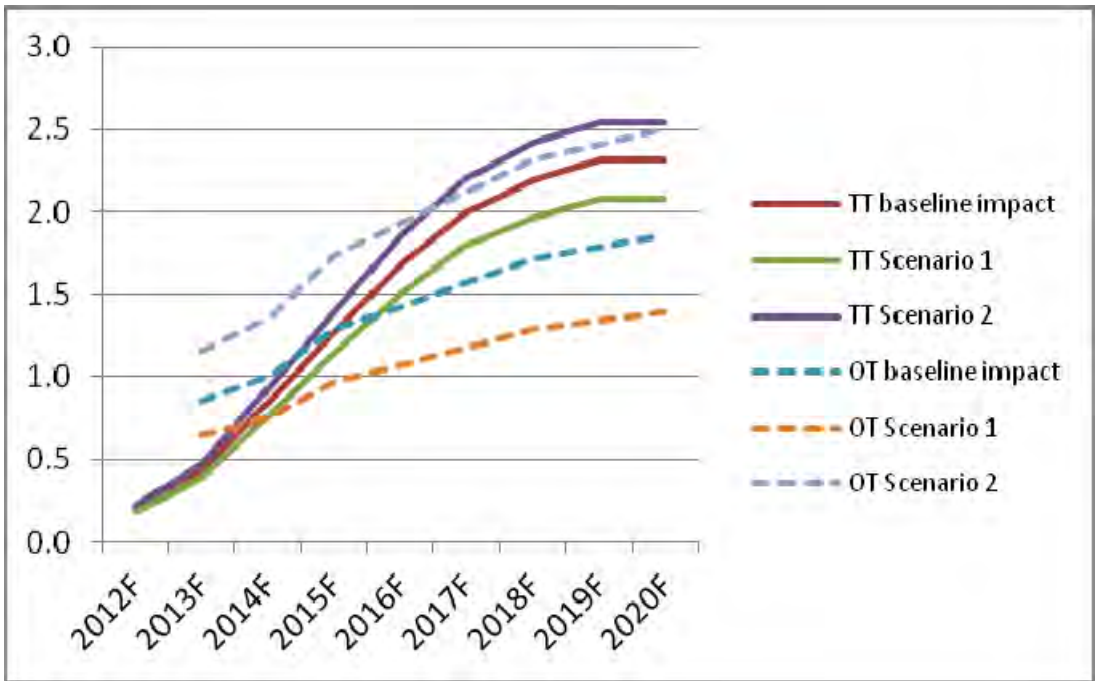
Under the baseline scenario, the additional impact of the government revenue by these two projects as of 2015 would be about US$2.6 billion, and for the next five years after 2016, when construction of the UB Metro starts (therefore the Mongolian Government is to start allocating its budget), the impact would translate to about US$3.5 to US$4.2 billion. Accumulated additional increase in the government revenue would reach US$18.9 billion during the five years. Figures 7.4.1 and 7.4.2 illustrate the impact of the OT and TT development under different scenarios on the government revenue.

Total investment of the Mongolian Government is estimated at this moment to be US$1.3 billion, which is equivalent to 7% of the accumulated additional increase in the government revenue by the mine development during the five years. Total budget of Mongolian Government (Expenditure) for FY 2013 is MNT 7.5 trillion (about US$5.3 billion) and the estimated budget size for FY 2016 is estimated to be over US$10 billion.

Table 7.4.1 ：Aggregate Impact of OT and TT on Government Budget Revenue（US$ Billion）

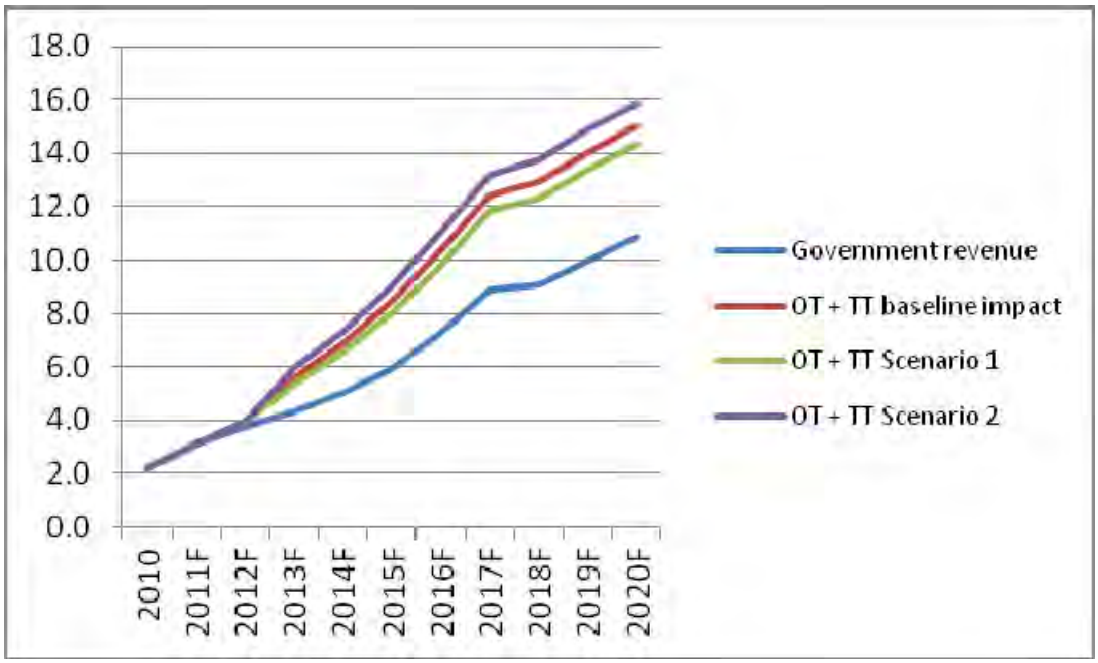
		2010	2011F	2012F	2013F	2014F	2015F	2016F	2017F	2018F	2019F	2020F
1	**Government Revenue: (IMF Forecast, not including impacts from TT and OT)**	**2.2**	**3.1**	**3.8**	**4.3**	**5.0**	**5.9**	**7.3**	**8.9**	**9.1**	**9.9**	**10.8**
2	TT Baseline Impact			0.2	0.4	0.8	1.3	1.7	2.0	2.2	2.3	2.3
3	TT Scenario 1			0.2	0.4	0.8	1.1	1.5	1.8	2.0	2.1	2.1
4	TT Scenario 2			0.2	0.5	0.9	1.4	1.9	2.2	2.4	2.5	2.5
5	OT Baseline Impact				0.9	1.0	1.3	1.4	1.6	1.7	1.8	1.9
6	OT Scenario 1				0.6	0.8	1.0	1.1	1.2	1.3	1.3	1.4
7	OT Scenario 2				1.2	1.4	1.7	1.9	2.1	2.3	2.4	2.5
8	**Baseline Aggregate Impact <2+5>**			**0.2**	**1.3**	**1.8**	**2.6**	**3.1**	**3.6**	**3.9**	**4.1**	**4.2**
9	Aggregate impact Scenario 1 <3+6>			0.2	1.0	1.6	2.1	2.6	3.0	3.3	3.4	3.5
10	Aggregate impact Scenario 2 <4+7>			0.2	1.7	2.3	3.1	3.8	4.3	4.7	4.9	5.0
11	**Government Revenue with TT and OT impacts (Baseline Scenario) <1+8>**	**2.2**	**3.1**	**4.0**	**5.6**	**6.8**	**8.5**	**10.4**	**12.5**	**13.0**	**14.0**	**15.0**
12	Government revenue with TT and OT impact (Scenario 1) <1+9>	2.2	3.1	4.0	5.3	6.6	8.0	9.9	11.9	12.4	13.3	14.3
13	Government revenue with TT and OT impact (Scenario 2) <1+10>	2.2	3.1	4.0	6.0	7.3	9.0	11.1	13.2	13.8	14.8	15.8

Source: BAEconomics, Frontier estimates, IMF forecast



Source: BAEconomics, Frontier estimates, IMF forecast

Figure 7.4.1 : Impact of OT and TT under Different Scenarios on Government Budget Revenue (US$ Billion)



Source: BAEconomics, Frontier estimates, IMF forecast

Figure 7.4.2 : Aggregate Impact of OT and TT (US$ Billion)

(2) Financing for rolling stock and related equipment

The Ulaanbaatar Metro Corporation (UBMC), an implementing agency of the UB Metro is assumed to procure the rolling stock and related equipment based upon the following policies.

(i) The government or UB city provides the direct investment in the majority (over 51%) of the capital.

(ii) As for the remaining capital (less than 49%), investment from the private investors in both Mongolia and Japan is promoted as strategic partners.

(iii) Possibilities of financing by the issuance of the UB Metro public bond with the government guarantee are examined.

(iv) As for funding for the purchase of rolling stock, co-financing of commercial banks and International Financial Institutions (IFIs) or JICA Private Sector Investment Fund (PSIF) and loan is examined.

(v) As for other working capital, loans from commercial banks or IFIs are utilized.

7.4.2. Financing Schedule

In accordance with the policies above, two concrete financing schemes are proposed (Figure 7.4.1 and Figure 7.4.2). The schemes share a common policy on the construction of the infrastructure as a public works with ODA fund from Japan. The main body of the project is the MRT but the UBMC is to be outsourced for the government to construct the infrastructure. After completion, the ownership of the infrastructure will be transferred to the government and the UBMC will be granted the right to use the infrastructure for a certain period (50 years) by paying a fixed infra-rent fee to the government.

Option A assumes that the UBMC is responsible for both the procurement of the rolling stock and related equipment and preparation for the opening of the metro. In this case, the UBMA needs the fund of 200 million USD, 30% of which will be from capital and 70% will be financed by loans.

On the other hand, option B does not require that the UBMC be responsible for the procurement but simply to fund the 50 million USD of opening expenses. In this case, rolling stock will be leased by a leasing company, newly established by the private sector. Thanks to this, the liabilities in the UBMC's balance sheet will be less, but the UBMC must pay a lease fee to the leasing company.

Which option should be taken naturally depends on the possibility of financing by investment and loans. In addition, the appropriate rate of the infra-rent fee also relies on the profitability of the UBMA and the rate is possibly a kind of subsidy by the government (refer to Chapter 10).

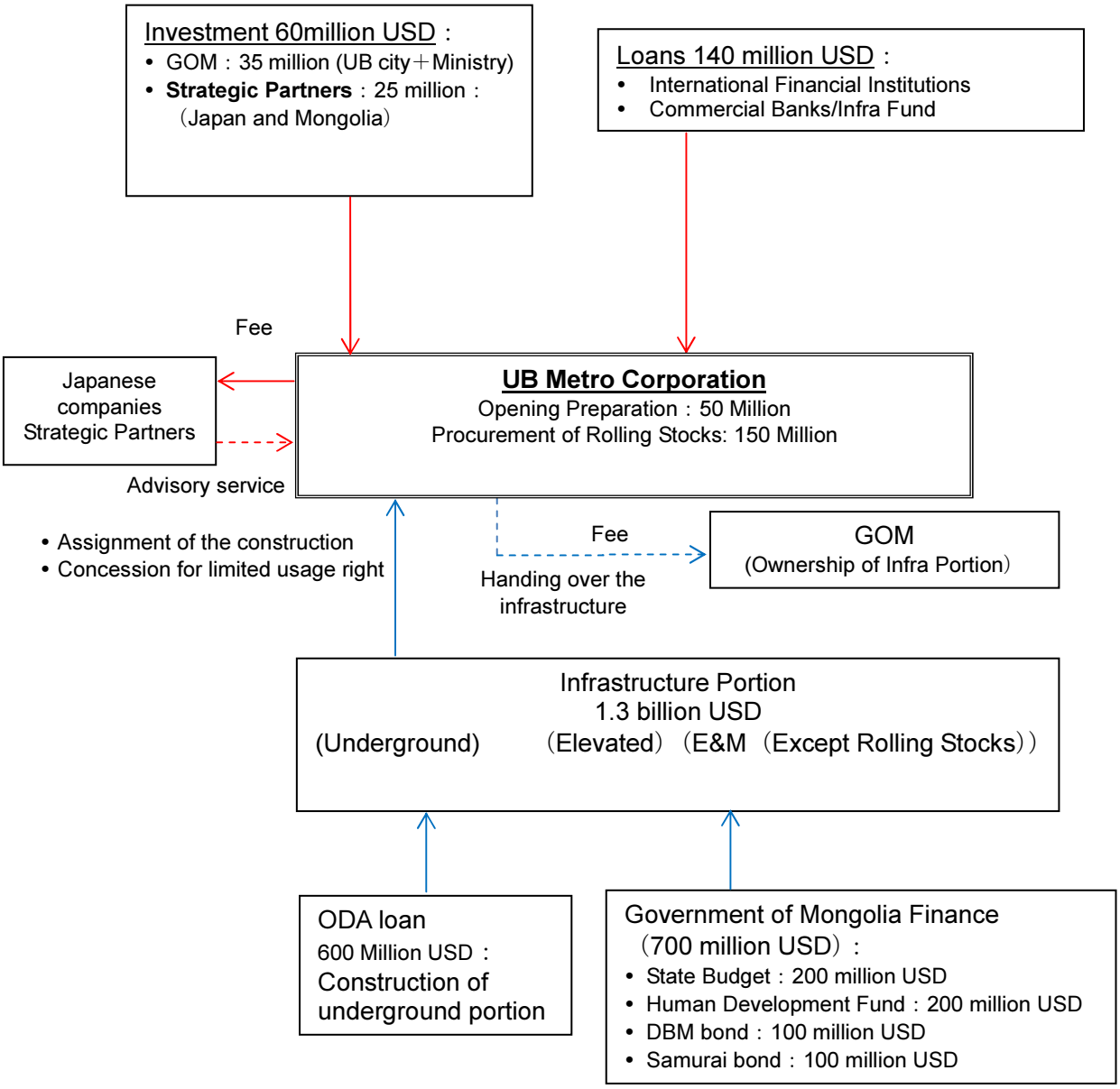


Figure 7.4.1 UB Metro Scheme (Draft) (Option A)

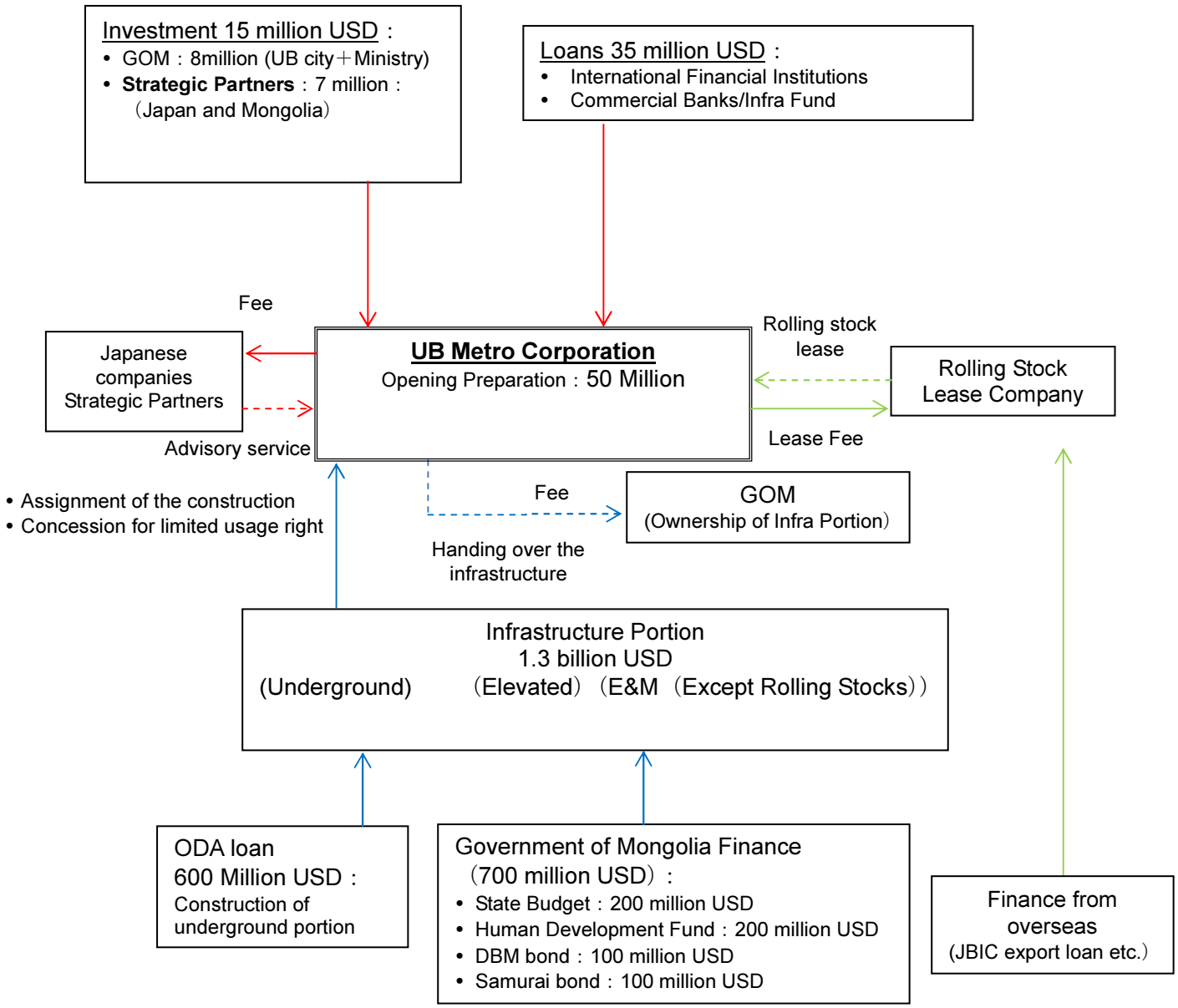


Figure 7.4.2 UB Metro Scheme (Draft) (Option B)

7.5. Overall Project Schedule

The overall project schedule greatly depends on how long a preparatory phase takes until the commencement of the construction. The construction phase takes at least four years and therefore it is necessary to be done with the preparation for the construction by the end of 2016, aiming the opening of the metro in 2020.

The critical point during the preparatory phase is a work for the preparation of the national budget of Mongolia and financing by ODA. At the same time, the schedule must consider administrative processes of Mongolia such as the amendment of the railway transportation law to introduce the urban railway system, budgeting and establishment of the UBMA, the approvals and permissions based on the concession law. The following is a schedule which considers a time span necessary for these processes and the detailed design, and has each step moves forward most efficiently (Figure 7.5.1).

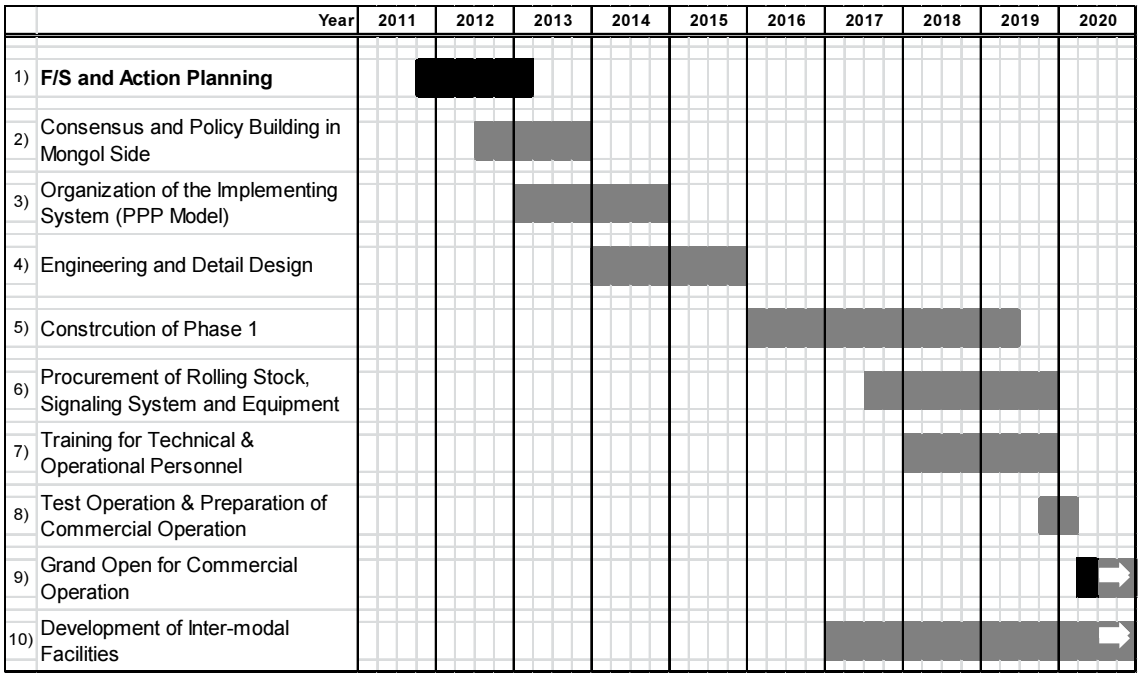


Figure 7.5.1 Overall Project Schedule (Draft)

8 Operation, Maintenance, and Management Structure

8 Operation, Maintenance, and Management Structure

The previous chapter examines an overall implementation scheme of the UB Metro and proposes the two-tiered public-main PPP scheme (public company scheme) as an optimal scheme. Based on this assumption, in this chapter, an optimal implementation scheme of operation and maintenance is examined.

8.1 Implementation Schemes of Operation & Maintenance

This section proposes a proper scheme of the Operation & Maintenance (O&M) of a railway system. Firstly, a description is given of the most common approaches to implement the O&M of a railway system. Although operation and maintenance schemes are closely related, these are described separately for the operation and maintenance aspects of the functions of an owner/operator. Secondly, the schemes are evaluated, and finally, a proposal is made for the most appropriate scheme for the UB Metro.

Considering the funding and implementation schemes discussed in Chapter 7, the most suitable O&M scheme is presented based on previous experiences on O&M schemes in other Asian countries.

8.1.1 Organizational Structure of Operation & Maintenance (O&M)

(1) The Metro Implementation Body on the Assumption of PPP

1) Points to note for the PPP project

As stated in Chapter 7, the government of Mongolia has clear policies which say that "the government shall provide the public transport services with responsibility" and "the UB Metro is the first urban mass transit system in Mongolia and the know-how from the private sector will be utilized to improve the inefficiency of the public services." Therefore, the two-tiered public-main PPP scheme is the most suitable.

Considering that a large part of the investment in the Ulaanbaatar mass transit systems will come from the private sector and that the projects will be implemented through PPP modalities, there is a need for an effective implementation agency. Furthermore, in Mongolia, the concession law that forms the basis for PPP project implementation was established in January 2010, and past records of successful implementation based on this law are still nonexistent.[1] This may call for the creation of a new business entity independent of the public administration which has a decision making body to effectively operate the UB Metro from the viewpoint of private investment.

Furthermore, in order for the Ulaanbaatar Metro to be successful, it is required to implement the institutional reform at the local government level and legal and regulatory reforms at the national level, which are necessary for the PPP scheme to progress smoothly, and to address the initial participation of private businesses in the urban railway management.

2) Establishment of the Ulaanbaatar Metro Corporation (UBMC)

The UB Metro is actually the first urban railway in Mongolia. The study team proposes the establishment of the Ulaanbaatar Metro Corporation (UBMC), which is a new public company, as explained in Chapter 7, with the support of the national government and Ulaanbaatar (UB) City, and the know-how of the private strategic partners.

The key objectives of the creation of the new entity are to:

- Secure a long-term investment from the public and the private sector.

[1] Refer to Chapter 7 as for discussions about the concession law.

- Leverage local and central government funds, external assistance as well as private funds, support private investment and to create a conducive environment to utilize the efficiencies, innovativeness, flexibility and the speed of the private sector to provide better infrastructure and service at an optimal cost.
- Set up a transparent, consistent, efficient administrative mechanism to create a level playing field for all participants and protect interests of all stakeholders
- Prepare a project list to be offered for PPP and take them forward through a transparent selection process.
- Put in place an effective and efficient institutional mechanism for the speedy clearance of the projects.

This section describes an organizational plan for the UBMC and those responsibilities and tasks with a focus on businesses conducting operations and maintenance as mentioned in this chapter.

The following Table 8.1.1 shows the list of tasks for which UBMA is responsible regarding the service operation and maintenance. This is the key to which tasks an individual party can access, review, handle and ultimately how a task is routed and approved.

Among the tasks and duties in Table 8.1.1, "Operation (III)" and "Maintenance (IV)" are tasks that private companies could do, when they contract for a part of tasks of the PPP project with the UBMC.

Table 8.1.1 UBMA Tasks and Duties

No.	Task Category	Description of the Task Category
I.	Management	To formulate policies, prescribe and promulgate the rules and regulations for the attainment of the objectives of the Authority Implements, enforces, and applies the policies, plans, standards, guidelines, procedures, decisions, rules and regulations issues, legal affairs, and public relations.
II.	Administration	The administration-related departments and sections shall advise and assist the Management in the formulation and implementation of rules and regulations necessary to carry out the objectives and policies of the authority concerning administrative, finance, accounting, budget, human resources, etc.
III.	Operation	To ensure the safe, reliable and efficient operating of the railway and satisfactory service to the passengers on a day-to-day basis.
IV.	Maintenance	To perform the daily and the long term planning and execution of scheduled and unscheduled, preventive and corrective maintenance actions to ensure overall systems are ready for required operation at all times.
V.	Engineering & Construction	Advise and assist the Management in the formulation and implementation of rules and regulation necessary to carry out the objectives and policies of the UBMA concerning engineering. Monitor and be counterpart of Consultants and supervise Contractors.

(2) Operation Scheme

The railway businesses in general and since the expansion of the industry in 19th century, has been developed with strong expertise in railway engineering as well as operational supervision, evaluation, management and control activities. Nowadays, railway companies provide comfortable and pleasant, safe and secure, and environmentally conscious travels. In addition,

they developed the IT based ticketing, fare collection and a settlement system serving also as a managerial information tool. Some auxiliary services such as the rolling stock and station cleaning, station security, ticketing and IT services are outsourced. Holding company options have been used when a railway has many lines and/or its business has a wide range of activities.

Those vertical and horizontal disintegrations are considered as a way to make clear the responsibilities of each activity and at the same time to achieve more effective operations. One should note—as the key feature in those cases—that the railway companies always keep their main operations and their management under their direct control.

Given the above future operation modality, a possible type of contract for the implementation of the UB Metro would be the following:

(A) Operation and Maintenance Concession under PPP Net Cost Scheme;

(B) Operation and Maintenance Concession under PPP Gross Cost Scheme;

(C) ODA including O&M Concession;

(D) Direct Operation and Contracting Maintenance;

(E) Direct Operation and Direct Maintenance; and

(F) Direct Operations with Contractual and Outsourcing as illustrated in the following table.

For purposes of convention, the government is the public party of the PPP, and “concessionaire” is the private party of the PPP.

Table 8.1.2 Type of Contract

Type of Contract	Definition
(A) Concession O&M (PPP Net Cost) Hybrid: Gov.:civil; private: E&M + rolling stock	The government manages civil infrastructure delivery using private sector contractors; government engages the private sector to provide electrical and mechanical (E&M) assets and trains and to undertake operation and maintenance (O&M) through a concession. The government leases civil infrastructure to the concessionaire. The government sets safety standards and the fare structure. The concessionaire determines services to be provided and retains fare and other revenue. The government may need to make additional payments to the concessionaire to cover revenue shortfall, and if revenue exceeds costs, the concessionaire pay back the excess to the government. This type is applicable when using a PPP scheme such as Build Operate Transfer (BOT for the E&M portion and Build Lease Transfer (BLT) for infrastructure.
(B) Concession O&M (PPP Gross Cost) Hybrid: Gov.:civil; private: E&M + rolling stock	The government builds civil infrastructure delivery using private sector contractors. The government engages the private sector to provide E&M and trains and to undertake O&M through a concession; government sets safety and service standards, service levels, and fare structure and level. The government pays the concessionaire an amount equal to the costs the concessionaire incurs in providing agreed services as established through a competitive, quality-based tender. The government retains all fare revenue. Same as above, this type is applicable when using a PPP scheme such as BOT for the E&M portion and BLT for infrastructure.
(C) ODA Implementation + Concession O&M Leasing (PPP Net or Gross Cost)	The government builds the entire infrastructure delivery using private sector contractors. The government provides civil, E&M and rolling stock and engages the private sector to undertake O&M through a concession. The government sets safety and service standards, service levels, and fare structure and level. The concessionaire retains all fare revenue. This type is applicable when using ODA or own funds to finance the project and outsourcing maintenance.
(D) Direct O & Contract M	The government builds civil infrastructure and E&M systems using private sector contractors using ODA or own funds. The government engages in overall operation activities with their own staffing. The government contracts with an external entity to provide maintenance services.
(E) Direct O&M	The government builds civil infrastructure and E&M systems using private sector contractors using ODA or own funds. The government engages in overall operation and maintenance activities with their own staffing.
(F) Direct Operations with Contractual and Outsourcing	The government builds civil infrastructure and E&M systems using private sector contractors using ODA or own funds. The government engages in overall operation activities by their own staffing for core operations but some non-core operations are contracted out or outsourced. The government contracts with external entity to provide maintenance and other railway related services.

(3) Maintenance Schemes

Maintenance management is a concept that integrates all the activities of maintaining and controlling rolling stock and other facilities ranging from commissioning to heavy repair. In order to maximize the effectiveness and productivity of the system as a whole, a planned but also corrective maintenance policy based on the future lifespan and the required budget, and the optimization of the maintenance, inspection, and repair system is required. Maintenance involves carrying out the functions of inspection, servicing and repair.

The maintenance scheme is basically composed of two things: that which is directly managed by the owner and that outsourced to a third party.

When the maintenance is outsourced, the important thing is to decide which portion to outsource. There are three methods of the outsourcing. A simple example is to outsource implementation operations while leaving the rest for the owner. Another method is to outsource everything but the analysis and work assignment level. In this method, work planning and scheduling will be done by the third party. While the third party can decide when to perform operations, the assigning authority will control what will be done. The third method is to have the assigning authority give the facility maintenance and improvement strategy (the utilization requirements of the facility) to a third party, who will then be responsible for addressing those objectives. Accordingly, the outsourcing contract will be drawn up through the combination of two methods: i) required functions and ii) required work specifics.

In actuality, an appropriate outsourcing system must be established through the combination of these methods, taking into consideration the owner's ability and business strategy, and the third party's ability.

8.1.2 Evaluation of O&M Schemes

In this section each type of contracts is evaluated in consideration of possible funding schemes.

(1) Operation by Concession

The first two types of contracts of the five mentioned in Table 7.1.2 correspond to the appropriate contract for an implementation funding under a PPP scheme (the Net Cost Scheme and the Gross Cost Scheme). They are applicable for either a wholly private funded project under BOT or, in case of a funding scheme, with a Public participation by means of Viability Gap Funding (VGF) or Hybrid scheme. A PPP scheme with Public contribution in the capital investment is the most probable funding scheme for funding the UB Metro. In case of a fully private investment project, the concessionaire owns the infrastructure and the Electrical and Mechanical (E&M) system, and in case of a public participation on the capital investment (Hybrid), the Government would own the infrastructure and leases it to the concessionaire, while the concessionaire owns the E&M system.

The main difference between these two schemes, the gross and net costs schemes, is who controls the revenue collection and the way of payment to the private concessionaire. In the case of the Net Cost Scheme, the concessionaire collects the revenue and pays an agreed fixed amount or a percentage of the revenue to the government (the implementing and supervisory agency, in our case UBMC). Although the risk of low ridership rests on the private party in this case, the concessionaire would usually request a Minimum Revenue Guarantee (MRG). In the case of a Gross Cost Scheme, the government retains the fare revenue by either collecting by itself or collected by the concessionaire and then transferred completely to the agency, and then pays an agreed fixed amount to the concessionaire. The risk in this case is entirely on the government side.

There are some points worth mentioning for both cases:

- The Net Cost Scheme

  This scheme puts most of the risk on the concessionaire, but to make the project commercially viable the Government is usually required to provide a Minimum Revenue Guarantee (MRG). However, the floor line should be carefully defined, as one too high will lead to lack of encouragement by the operator (concessionaire) to improve services or keep excellent maintenance, which may cause a moral hazard risk that the operator intends to make a possible reduction in capacity that does not greatly affect its profit. On the other hand, it should be some kind of protection for the concessionaire if the planned railway network assumed during forecast analysis is not completed as scheduled by the government. Under the Net Cost Scheme the owner/government has little hand-on control regarding the operation and maintenance of the system (a.k.a. *Loss of Control*), and also difficult to gain experience for its own in-house technical staff (a.k.a. *Loss of Expertise*).

- Gross Cost Scheme

  In the case of this scheme, the owner/government bears all the demand risk; there is a fixed amount to be paid to the concessionaire for O&M services and such amount is decided during a bid for the selection of the concessionaire. Therefore, there is no need of MRG. In this case, the government must supervise and control the operation and maintenance activities (supervisory control), but requires a sufficient level of technical capability to perform such supervisory control.

As we can clearly see, both schemes have merits and demerits in various circumstances around the world. Therefore, the conditions, requirements and needs of each agency or government will rule the decision on the best appropriate contract scheme.

Each type of contract could be tailored to the needs of the government and the project situation by incorporating specific clauses to address some issues mentioned above[2]. For example, loss of control and expertise can be addressed by a tight requirement of performance supervision by the Owner to the concessionaire and training throughout the concession period to the in-house staff.

(2) ODA + O&M leasing

The type (C) contract of the six mentioned in Table 8.1.2 corresponds to a project implementation funded by the Government's funds, either by ODA or other direct funding schemes. Although there is no contribution from the private sector on the project capital funding except for direct O&M by the government, these schemes are also considered as PPP schemes as private participation is still included in the operation and/or maintenance of the system, conveying some of the risks to the private sector.

Once the infrastructure is built, the entire operation and maintenance is leased to a concessionaire for a certain period of time based on public bidding. The Net Cost Scheme and Gross Cost scheme can be considered for the contract, but many are implemented with the Net Cost Scheme. In this case, the private sector assumes the market risk, but controls the revenue. The concessionaire pays a fixed amount to the government for the leasing of the facilities.

[2] As for security package to secure the sustainable operation, refer to Chapter 9.

(3) Direct Operation by Owner

The last three types of contracts of the six mentioned in Table 12.1.2 correspond to a project implementation funded by the government's funds, either by ODA or other direct funding schemes. Like the case of (C) mentioned above, albeit there is no contribution from the private sector on the project capital funding, except for Direct O&M by the Government, these schemes are also considered as PPP schemes as private participation is still included in the operation and/or maintenance of the system, conveying some of the risks to the private sector.

In all these cases, the government, using its own funds, contracts private contractors to build the infrastructure and E&M systems. The difference among them is the outsourcing of operations or maintenance. In the case of maintenance outsourcing, the methods are evaluated in detail in subsequent subsections.

If the government has a good financial condition, this scheme could be applied; but the global trend is to include the participation of the private sector in order to reduce the financial burden of the State, allowing more resources to be used for other urgent matters. Therefore, the challenge is how to obtain private capital while adopting these schemes.

Another challenge is how to obtain the know-how in the case of countries which have no internal experience with urban railway operation, like Mongolia. In order to resolve this, it is possible to construct infrastructure and E&M systems, and administer operations and maintenance while aiming for cooperation with private companies who have the expertise and specific know-how so technology can be transferred to the local people.

8.1.3 Proposed O&M Scheme

(1) Legal standpoint of the railway

The characteristics of the railway in Mongolia are determined by the "Railway Transportation Law." According to this law, the form of the railway is presupposed to be two-tiered, and is divided below.

- It is stated that "land used by the railway is government property (Article 6.1)" and "fundamental structures that bear a role important to national economics and society will be owned by a public company which is entirely or largely funded by the government, and if new construction is possible because of a provision to turn it over to a public company after a certain period of time in use, these fundamental structures and the policy of the railway line will be decided by the government (Article 6.2)" Also, the definition of "fundamental structures" is stated as "upper and lower structures of the railway line, rail bridges, tubes and other engineering facilities, stations, lay-bys, electricity that supports ordinary train routes, water, communication, information facilities, railway crossings, safety fences and other sets of mechanical facilities (Article 3.1.2)."
- A "Special permit for railway transportation services" is necessary for the "construction and use of fundamental structures" and "railway transport activity" (Article 16.1). There is no particular provision regarding this subject.

Moreover, it is a general rule that in the current law, a national body will possess the "fundamental structures," and in contrast with the BOT being incidentally recognized, possession of vehicles and transportation maintenance is widely made available to the private sector.

Also, the UB Metro will be the most important urban transport in Mongolia, and it is generally thought that it will be the railway that will "bear a role important to national economics and society" stated in Article 6.2[3].

(2) Mongolia's way of thinking regarding urban transportation

Currently, public transportation in Ulaanbaatar city comprises mainly private cars and buses and since it is stated in Mongolia's "Road Transportation Law" that "decisions on setting and changing routes for inter-prefectural, provincial, prefectural capital, city and city surroundings will be made by the corresponding prefecture and capitol governor, and will be enforced by the authority given by the prefectural/capitol governor" (Article 8.4), Ulaanbaatar's public transport must be the responsibility of Ulaanbaatar city.

As long as the UB Metro does not directly affect any existing railways, the responsibility within the city public transport must be considered, and it is strongly thought that the city must bear the responsibility of drawing up plans and operations. But regarding expenses, without progress in the decentralization of the budget and the city's small independent funding, it is strongly believed that the national government must bear the responsibility. Furthermore, it is also believed that, in accordance with the Railway Transportation Law, the government should also bear the responsibility in terms of the technical supervision.

(3) The Mongolian side's awareness of construction and operations through the concession system

Due to the Concession Law in Mongolia, the way is open for the private sector to conduct business that must be performed by a public agency of the national government itself. However, a substantial amount of time is needed to utilize the law and conduct BOT and BLT, and the capacity of the government is not sufficient to smoothly follow the necessary process for the formulation of consensus regarding the operating conditions of the UB Metro.

(4) The public transportation department's awareness of private sector operation

The government is not thought to perform good business management in Mongolia. However, the private sector also did not necessarily obtain a good assessment of its city bus operation, and so there is also a certain constraint in handing over the entirety of operations to private businesses.

(5) Technological experience for urban railway

Because Mongolia only has a non-electrical wide-area railway and lacks construction experience for elevated and underground railways, they are aware of the necessity of assistance from organizations which have overseas experience with the construction and operation of urban railways requiring high density transport.

In terms of outsourcing of tasks regarding the operation and management, except for a single part of operations being implemented by the Ulaanbaatar railway, there is no business within the country that performs outsourcing, and if outsourcing is to be conducted, overseas businesses or overseas business support and outsourcing companies must be built within the country.

(6) Thoughts on overseas businesses

There is strong dissatisfaction with the Ulaanbaatar railway with 50% of the investment coming from Russia, leaving Mongolia with its hands tied. Considering the recently enacted Law on

[33] From the interviews with the Ministry of Roads and Transportation and the Ministry of Economic Development

Regulation of Foreign Investment[4] that rules overseas investments for mine development must have an investment percentage of under 49%, and in light of the UB Metro being the first urban type railway in the country, there are deep-seated arguments against entrusting overseas businesses with its operation. Even if the participation of overseas businesses is accepted, it is required to develop a cooperation system based on the human resources development, so that the Mongolians themselves can spearhead the management of the Metro after a certain period.

(7) Proposal for an O&M scheme and construction with respect to the preconditions in (1)

Table 8.1.3 shows the O&M scheme based on the organizational structure shown in Table 7.1.2 with the above-mentioned conditions.

Table 8.1.3 System Plans Matched with Each Condition

	1) Conformity to the railway law	2) Involvement of the government in urban transport services	3) Application of concession law	4) Hesitation to dependence on the private sector	5) Acquisition of technical expertise and experience	6) Capacity building of domestic companies
(A) O&M concession (PPP Net Cost)	○ Control of fundamental structures will be transferred to the government in the future	○ The city will supervise the private sector	×	×	○ Overseas businesses will participate	△ Domestic business agents will be difficult
(B) O&M concession (PPP Gross Cost)	○ Control of fundamental structures will be transferred to the government in the future	○ The city will supervise the private sector	×	×	○ Overseas businesses will participate	△ Domestic business agents will be difficult
(C)ODA+O&M concession	○	○ The city will supervise the private sector	×	×	○ Overseas businesses will participate	△ Domestic business agents will be difficult
(D) Directly managed O & private M	○	○ The city will be the focus	○	△Cooperation with the private sector is necessary	△ Overseas business support and establishment of outsourcing are necessary	△ Domestic business agents will be difficult
(E)Directly managed O&M	○	○ The city will be the focus	○	△ Cooperation with the private sector is necessary	△ Overseas business support is necessary	○
(F)Directly managed O with outsourcing	○	○ The city will be the focus	○	△ Cooperation with the private sector is necessary	△ Overseas business support and establishment of outsourcing are necessary	○

Legend: ○: possible to be applied, △: possible to be applied with conditions, ×: impossible to be applied

[4] Refer to the "Law on Regulation of Foreign Investment for companies operating on sectors of strategic importance" May 2012). Regulations under the law are presently under parliamentary discussion. As of April 2013, the draft amendment of the Law is being prepared to lift this investment condition.

Given the legal constraints in 1), options of those responsible for the lower half of the two-tiered system (infrastructure development) are: (i) Countries wherein government corporations which perform construction and maintenance receive the majority of the capital from the national government; and (ii) BOT or BLT which have the possibility of transferring operations to the national government in the future after having the private sector perform construction. However, in Mongolia, because of the problem of the Concession Law stated in 3), (ii) is not preferred and only a few possibilities exist that the private investors will participate in the construction of infrastructure. Rather than that, there is a strong inclination to have the national government take responsibility for the construction through ODA support instead of (ii). Therefore any of (D) ~ (F) will become the basis.

On the other hand, in terms of operations and maintenance, based on the fundamental policy in 2), there are two options: (i) With the city as the focus, operating agents will be uniquely created, and; (ii) the private sector, supervised by the city, will be entrusted with operations; but based on the conditions in 5), there are no private businesses inside the country which can perform these. If (ii) is implemented, there is no choice but to rely on overseas businesses. However, if the circumstances in 6) are taken into consideration, entrusting to overseas businesses is not considered, and as a result (i) is appropriate, wherein the city itself will become the focus. Because of this, it is reasonable to choose (E) or (F).

However, because it is not possible to completely construct operation and maintenance systems ahead of time due to the circumstances in 5), it is desirable to conduct operations after selecting trusted experienced overseas companies as partners. Also, in recognition of 4), things related to the operation and maintenance of public businesses established through the joint investment of the city and the private sector are also desired from the viewpoint of the improvement of services.

Therefore, the establishment of an operation and maintenance system is the most appropriate through the formation of a public company from the investment of overseas business partners and private businesses, especially those experienced in technology and service, as well as an investment of more than 51% by the city (Figure 8.1.1).

Thus, instead of the operating agency being entirely and directly managed by the city as in rows (E) and (F) (Table 7.1.3), it is possible to see a transformation in the structure to a public company with the participation of overseas businesses. In this case, there are currently no domestic businesses that can be entrusted with operations and maintenance; but since maintenance also exists for the Ulaanbaatar railway inside of Mongolia, a part of operations and maintenance can be entrusted to a company established from both the UB Metro and Railway with the support of foreign businesses. A structure with operations outsourcing to that company (as in (F)) is desirable.

Because the UB Metro cannot be assumed to have multiple operators, in the case of implementing the actual construction and procurement based on the premise of an operations and maintenance system like this, a concrete route and facility plan singularly implemented by a public company acting as the operation system is a better method of efficiently drawing up a plan.

To this end, it is appropriate that the public company shall perform the operations and maintenance (or the city and participating businesses until its formation) in order to fulfill its fundamental role from the time the plan is formulated, and the national government will assume the role of securing financing and checking from the aspect of policy.

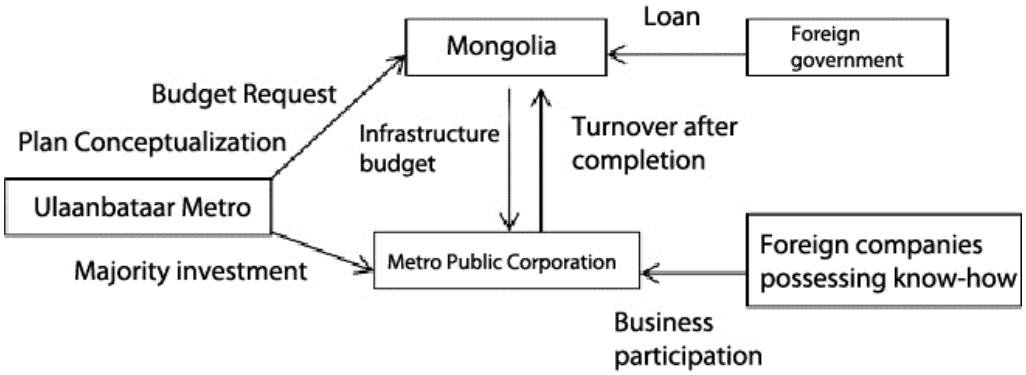


Figure 8.1.1 Organizational Structure of the Ulaanbaatar Metro

8.2 Structure of Operation and Maintenance

The operator and the maintenance contractor's objective in developing the organizational structure should be to ensure that the organization will provide clear lines of formal communication and control, and effective informal communications (networking). The organization must also function smoothly both internally and in its relationship with its counterpart (UBMC/Contractor) and the various agencies that will be involved directly or indirectly with the project. Regarding the contract between those organizations, it must provide the correct balance of management and operational staff, the optimum numbers, and training for staff to ensure the technical and managerial success of the maintenance activities for the UB Metro.

Accordingly, the operator/maintenance contractor should take guiding principles in its organization structure and adopt the concept of fully integrated teams. The entire organization could be subdivided into management/administration and site maintenance groups.

An organizational chart of the operator (UBMC) is shown in Figure 8.2.1 and that of the maintenance contractor is shown in Figure 8.2.2, which is a suggested functional framework assuming a relatively large-scale maintenance operation can be introduced instead of individual facilities. Maintenance operators can be segmented depending on the subject, or alternatively, there is a great possibility that one section will directly supervise the operators; but whichever the case may be, the organizational development must be performed in order to implement a singular operations and maintenance structure from the total framework of the operators and maintenance operators.

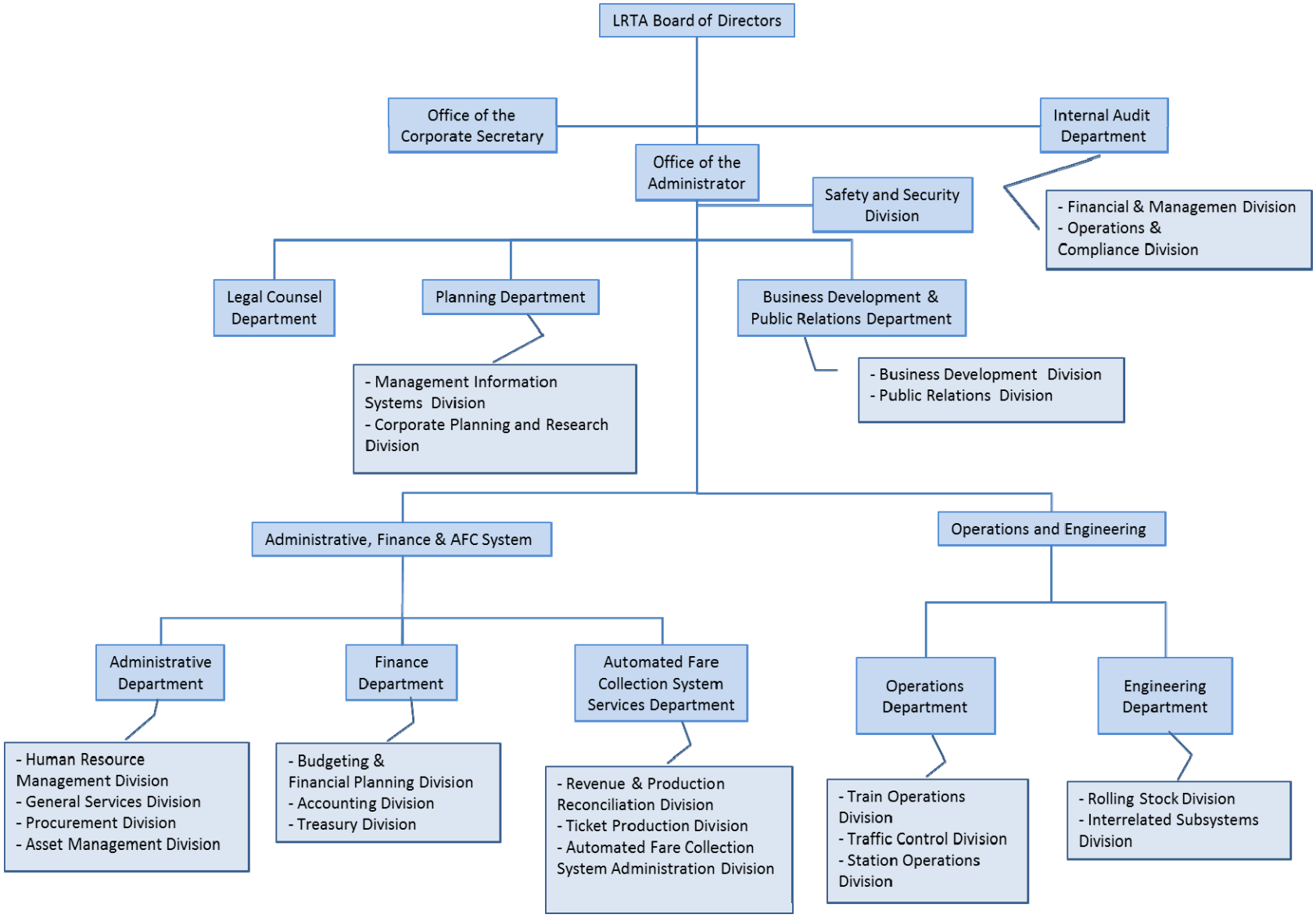


Figure 8.2.1 Organization Chart of Operator / Supervisory Agency

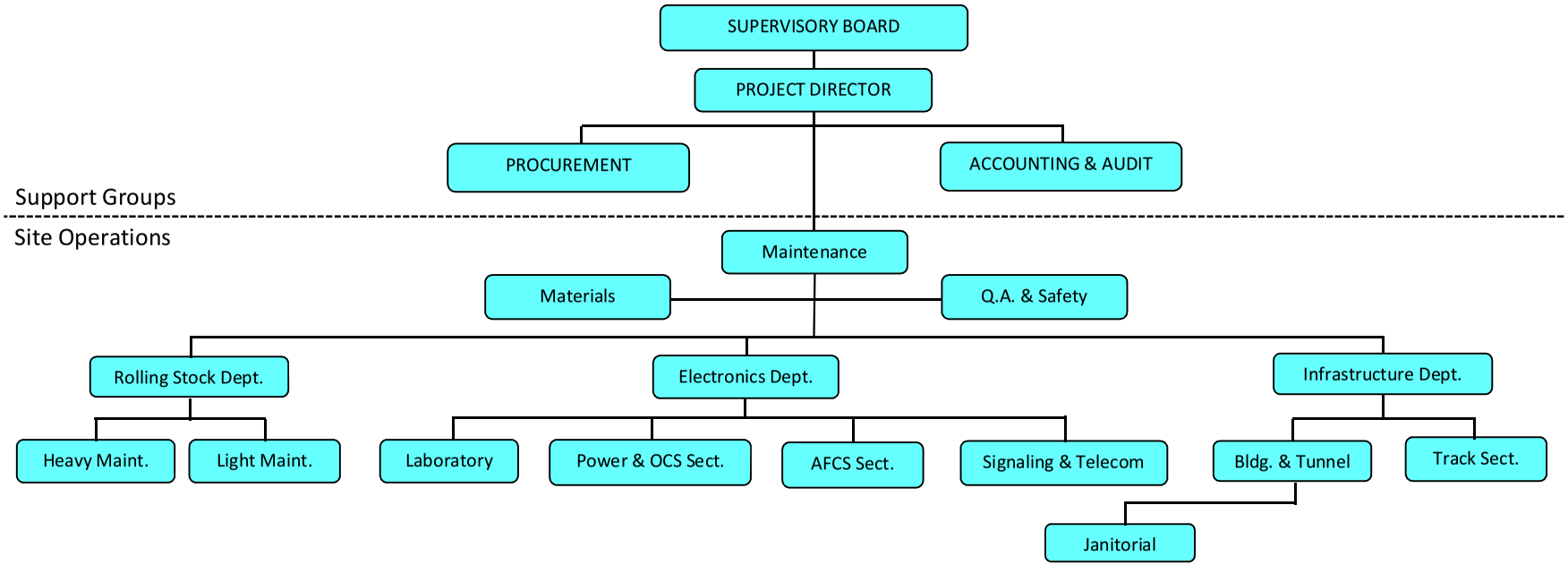


Figure 8.2.2 Organization Chart of Maintenance Contractor

8.3 O&M Cost for UM Metro

The Operation and Maintenance cost for the UMRT was estimated based on the Operation plan envisaged in Chapter 4. The parameters used to determine the cost are the track length, number of stations, number of trains, train-km/year, number of RSS, etc.

Except for electrical power rates, the prices of each item were estimated using current unit prices of existing railway system, in this case LRTA of Manila, which both countries have similar price level. Thus, no correction was made for unit prices.

The unit price and quantities used as the basis of the calculations, as well as the resulting yearly itemized breakdown of costs, are shown in Table 8.3.1.

Table 8.3.1 Operation & Maintenance Cost

Item/Year	Unit Price	Unit	2020		2030	
			Qty.	Cost	Qty.	Cost
Manpower				**11,650.5**		**12,116.2**
Administration, OCC, fixed	3,895.86	LS	1	3,895.9	1	3,895.9
Stations	186.15	Stations	14	2,606.2	14	2,606.2
Civil, Tracks	102.79	track km	17.64	1,813.2	17.64	1,813.2
Rolling Stock	93.14	trains	10	931.4	15	1,397.2
Power	49.92	No. of RSS	7	349.5	7	3495
Janitors	146.74	Stations	14	2,054.4	14	2,054.4
Spare Parts				**17,815.8**		**19,743.2**
Capital	8,769.96	train-km	1,468,001	12,874.3	1,648,282	14,455.4
Consumables	3,366.14	train-km	1,468,001	4,941.5	1,648,282	5,287.9
Power	3,733.44	train-km	1,468,001	**5,480.7**	1,648,282	**6,153.8**
Office Rental & Maintenance	0.36	m^2	2,700	**975.6**	2,700	**975.6**
Station Services	355.31	Stations	14	**4,974.4**	14	**4,974.4**
Total (Mill. MNT)				**40,897.0**		**43,963.2**
(Mill. US$)				**(29.2)**		**(31.4)**

8.4 Establishing the Operations and Maintenance System

On the assumption that the operation and maintenance organization will be an implementing agency as proposed in the previous section, steps in preparation for opening the UB Metro will be shown as follows.

8.4.1 Steps in Establishing the Operations and Maintenance System

(1) Planning/Basic Design Stage

The hardware plan for the railway is essentially something that must be decided based on what sort of operations in what kind of scheme will be implemented. Therefore, an entity which mainly carries out that operation is required when planning the railway.

Generally, in an urban railway, a local government authority will, based on urban transport policies, independently carry out facility planning based on an operations structure and a standard of provided services. However, Mongolia has no experience in operating urban railway systems and it is difficult for Ulaanbaatar city by itself make decisions.

On the other hand, as discussed so far in this chapter, in order to upgrade the UB Metro and make use of a variety of overseas knowledge, it is proposed to develop operations and establish a public company

"Metro Public Corporation (UBMC)" which would be comprised of the city and the external private sector combined into a single body. For the concept of a railway that aims to actualize and fulfill the role of an urban transportation railway in the future, operations must be developed using a structure decided by Ulaanbaatar city which is the principal shareholder of the UBMC, and is also ultimately the main planning body that will take advice from overseas businesses participating in the UBMC—based on their experience for upgrading and operating urban railways.

In order to implement this, the UBMC must be established prior to the planning stage of UB Metro. It is also preferable that a system is developed for possible discussions about an overall scheme, including the hardware plan by members who can fulfill the primary role of the UBMC from the initial stage.

Therefore, if it is firmly decided to develop the UB Metro, the UBMC or the UBMC preparatory organization (collectively referred to as the "UBMC") must be established as soon as possible. At this stage, the UBMA is assumed to be the minimum organization to make decisions in the future.

Furthermore, with the city and UBMA as the main body and with cooperation from the national government, it is necessary to implement the basic design and detailed planning of the UB Metro. After securing the investment necessary to address this kind of system and basic planning operation, a period of two years will be necessary to finish basic planning and start construction.

(2) Construction Bidding/Construction Management Stage

After the completion of basic planning and procurement of the necessary capital for construction, implementation of bidding and ordering and construction management will be conducted by the UBMC. At this stage, it is also necessary to procure the needed personnel in order to implement outsourcing of construction management as well as bidding.

Therefore, it is necessary to start the recruitment of personnel six months before the completion of basic planning, and when the basic planning is completed, it will only be necessary to secure the suitable personnel to transfer for bidding works.

Also, if operations and investment procurement is performed in an orderly manner, one year is required from the start of bidding until the commencement of construction, and the period for construction will be 4~5 years until completion.

(3) System expansion towards the start of business

Prior to the start of business operations, it will be necessary to train the personnel, particularly the 50 or more drivers require for the start of operation. If continuity is taken into consideration, 70 drivers should be employed after that time. Due to the large numbers of required drivers, the hiring of a number of instructors at the stage when on-site training is possible is advised. The driving instructors who develop the system to train drivers on site by themselves must be trained overseas since there is no training facility in Mongolia.

The selection of personnel to be trained overseas must be in accordance with the training system of the concerned parties abroad. In this regard, the personnel will be required to speak the language of the corresponding country. On the assumption of training in Japan, for example, 10 Mongolian personnel will be selected and pursue one year of training in Japan with proper education allowing them to become instructors themselves. This would necessarily include Japanese language lessons. Subsequently, the personnel will train the drivers, including test drives at the start of operations for a part or section of the completed area. In case the period of training in Mongolia will take one year and the test drive will take six months to complete, training in Japan for the driving instructors will have to take place two and half years before the start of operations.

It will not be a problem if the training period in other areas is short compared to that of the drivers, but train control center personnel require six months training before the start of test-driving. There are 10 personnel, so a Japanese person will conduct training at the actual site. In order to be able to start training, recruitment will need to be done one year before starting operations. The training period for station

employees should take half a year from the start of test-driving. However, the number of personnel is more than 200, and therefore it is desirable that 20 personnel will be trained as instructors in Japan and the on-site training system will be developed. The training period for each instructor is assumed to be one month.

As for the required maintenance personnel, there will be no problem if training is started at the actual site from the time the test-drive commences. Therefore, like the station employees, the employment to secure the necessary number of maintenance personnel will be carried out half a year before the start of operations. However, two Japanese-speaking persons per area should be employed before that to undergo training in Japan.

Furthermore, regarding maintenance, it is necessary to decide what to do regarding the division of outsourcing and self-production as well as the assignment of outsourcing. In order to address this at the start of test-driving, it is necessary to proceed with preparations for each.

It is expected that in 2030, 580 Mongolian personnel will already be working with various necessary training programs for the UBMC, including 80 head office staff which are not mentioned above (see Figure 8.4.1).

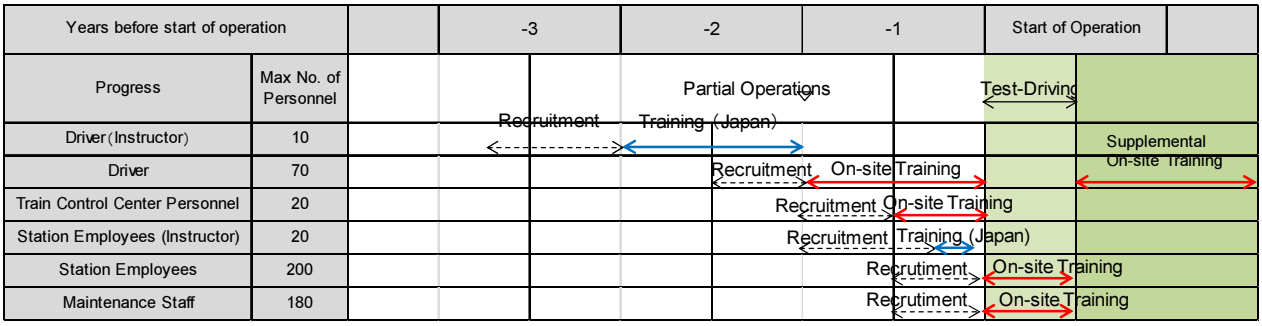


Figure 8.4.1 Schedule of Personnel Training for the Start of Operations

8.4.2 Costs for establishing the system as well as the transfer of know-how

The operational costs including the investment needed for supervision of operations after the start of business as well as to establish the system indicated in Figure 8.4.1 and before starting operation is indicated below.

Table 8.4.1 Operational Costs for the Preparation for Starting Operation

Cost Item	Years Before Operations Start							Years After Operations Start			
	7	6	5	4	3	2	1	1	2-4	5-9	10+
Japanese Personnel	5,330	5,330	5,330	5,330	5,830	9,080	10,080	10,420	9,000	5,170	0
On-site Personnel	1,830	1,830	2,330	2,330	2,500	3,250	8,080	11,650	11,650	11,650	12,120
Training cost in Japan	290	0	0	0	830	830	1,000	0	0	0	0
Electricity	0	0	0	0	0	670	3,740	5,480	5,480	5,480	6,150
Maintenance,Service & Others	670	670	830	1,170	1,670	4,170	16,070	23,770	23,770	23,770	25,690
Total (Mill.MNT)	8,120	7,830	8,490	8,830	10,830	18,000	38,970	51,320	49,900	46,070	43,960
Total (Mill.US$)	5.8	5.6	6.1	6.3	7.7	12.9	27.8	36.7	35.6	32.9	31.4

8.5 Legal Issues related to the Construction, Operation, and Maintenance of UM Metro

8.5.1 Important procedures in the current Railway Transportation Law

(1) Special permission for the support of railway transport services (Article 16)

The required permission from the government in the Railway Transportation Law is to acquire a special permit as stated in Article 16. The permit is divided into three items: construction and use of fundamental structures; production and assembly of fundamental and operating structures; and repair and operation.

Aside from what is determined by Article 11 of the "Special Business Permit Law", the entirety of the permit includes permits from "General F/S" and "Special permit regarding the operation of possessed railway facility, notarized certified copy." In addition, for the construction and use of basic structural materials, an "Environmental Impact Evaluation," "Investment Scale/Method of Procuring Investment," and "Starting Business Period/Borders of Occupied Land" must be created.

After the acceptance of these by a governmental agency, safety and performance checks will be made to comply with standards and regulations, and after confirming that there is no problem concerning environmental damage, a permit will be issued. A detailed explanation of the blueprints will be necessary in order to carry out these inspections; therefore a submission will needed although not mentioned in the law.

(2) Technical standards (Article 17)

The fundamentals of technical standards is set by the government, but as a special case such as "if it is not against regulations and producer and consumer interests, and not harmful to domestic safety, public interest, public health, and the natural environment," international standards or overseas excellence standards can be used with the permission of the government. In order to develop the technical standards for urban railways such as the Metro, the assistance from the experienced countries is essential.

(3) Others

Aside from the above, procedures such as the receipt of a certificate for construction and operation of the section related to railway transport safety (12.4.5), supervision of railway construction expansion and new additions (12.4.6), the approval of a "route map" important in coordinating routes (25.1), registration of management machines for important route maintenance (25.4), preparation of a duty roster related to safety (12.4.9), supervision of carriage fees/service area/contract modification (12.4.3), and creation of a database for railway transport area statistics (12.4.10) will be required with the authority of a government agency.

These procedures and the important areas that have jurisdiction over the Metro will need to be coordinated later because the current law basically does not have urban railways and independently operated railways in mind.

8.5.2 Challenges for the Metro Construction and Operation in the Current Railway Transport Law

With a current railway transport law which is not updated with consideration of an urban railway, and because the government issuing a permit for railway operation and arranging supervision is a basic thing, it should be fairly flexible in terms of the law for the two-tiered system.

Also, because technical standards are essentially established by the national government, it should be checked, reviewed, upgraded and arranged so that it is possible to accept international standards and overseas standards as applicable in a special case. There is a worry that delay in an upgrade to technical standards will lead to a delay in operations, so if this article is invoked, even without possessing the government's upgrade standard, there is a strong possibility of compliance with the application of the special case[5] .

If these are considered, it is possible to proceed with a comprehensive upgrade of the Metro under the current law. However, from the very beginning the current law is based on the concept of the "Ulaanbaatar railway", which is a government-owned railway, and does not presuppose an independently operated railway like the Metro. And because the administrative agencies of government employees in charge of supervision are not clearly separated from those in charge of operations, there are a lot of unclear portions in terms of which laws actually apply to the Ulaanbaatar Metro. Therefore it will be necessary to proceed with gradual coordination with the related government agencies on how the law will apply to the progression of operations.

[5] The area of "overseas" meaning is unclear and it must be a complete copy of overseas standards.

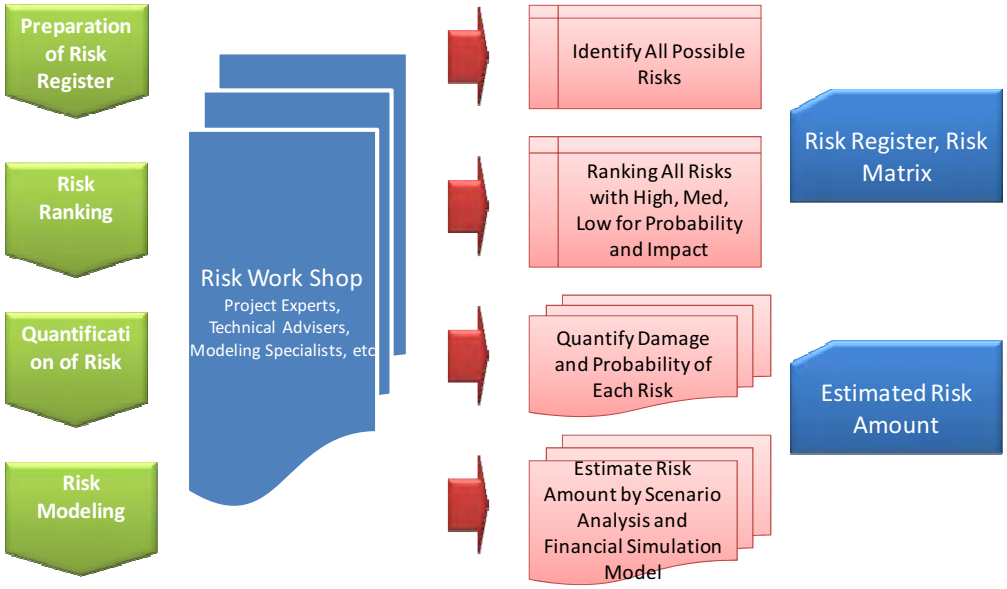
9 Project Risk Analysis and Security Package

9 Project Risk Analysis and Security Package

9.1 Methodology for Risk Analysis

9.1.1 Steps of Risk Analysis

The risk analysis of this study was conducted on the basis of the procedures as illustrated in the figure below: (i) Identifying and listing up all the possible project risks; (ii) Ranking those risks; (iii) Quantifying those risks; and (iv) Incorporating those possible risks into financial simulation model .

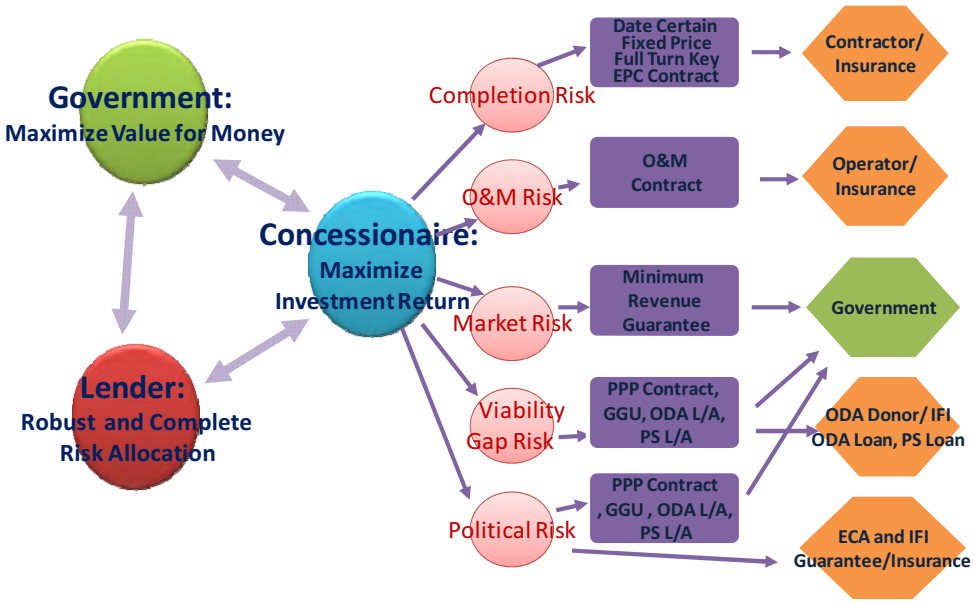


Source: JICA Study Team

Figure 9.1.1 Steps of Risk Analysis

9.1.2 Methodology for Risk Allocation

Risk allocation of PPP project, as illustrated in the following figure, aims to make adjustment with three major stakeholders who have opposing interests, and to consider how individual project risks such as completion risks, O&M risks, market risk, viability gap risk, political risk and so on, are managed by reflecting risk management measures in project contract, procuring various guarantees, and protecting it by insurance, etc. It is a process in which a private sector concessionaire is to make adjustment of requests and requirement from both the public sector and financier, and to allocate individual risks to various stakeholders through contracts, insurances and guarantees.



Source: JICA Study Team

Figure 9.1.2 Methodology for Risk Allocation

9.2 Risk Management Measures for Major Project Risks

9.2.1 Major Risks for PPP Metro Project

The following figure shows general perception of important risks in a PPP Metro project. The following risks are considered important:

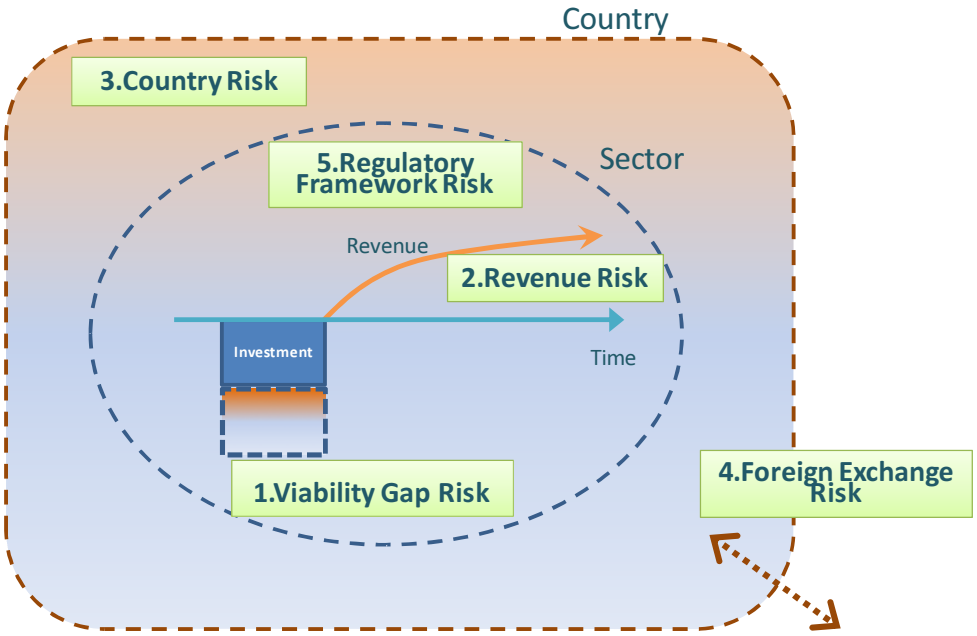
(1) Viability Gap Risk

(2) Revenue Risk

(3) Country Risk

(4) Foreign Exchange Risk

(5) Regulatory Framework Risk

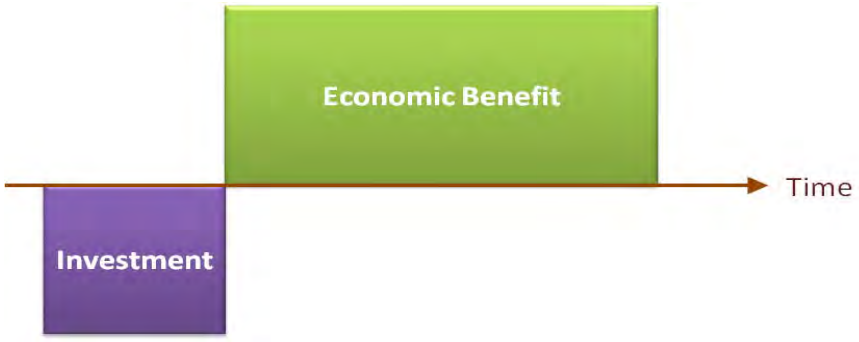


Source: JICA Study Team

Figure 9.2.1 Major Risks of PPP Metro Project

9.2.2 Viability Gap Risk

The most important project risk is the financial Viability Gap Risk. A Metro project could bring about significantly large economic benefit and could contribute to economic growth of that area. For example, the Economic IRR calculated for this project is over 15%[1], which tells that although its investment is huge, the economic benefit is also huge.



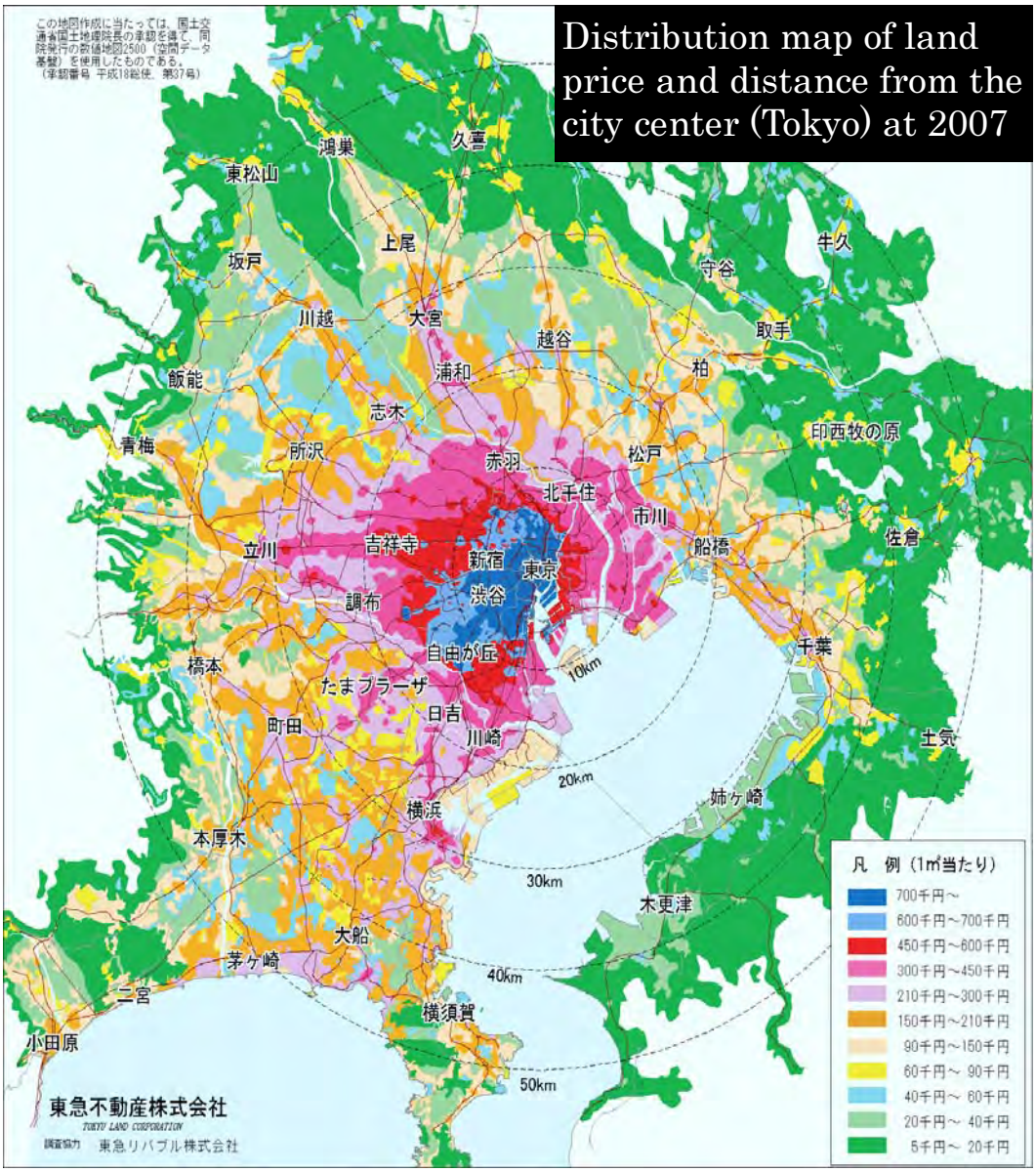
Source: Study Team

Figure 9.2.2 Large Benefit of Metro Project

The following figure shows the distribution of land in terms of price in Tokyo Region. High-price land areas radiate along the railway lines forming a human hand shape. As such, a railway line could facilitate economic activities; thus a raise in land prices along the railway line.

[1] Refer to Chapter 10 for details about EIRR.

This is one of the proofs that a metro project could bring about large economic benefits.

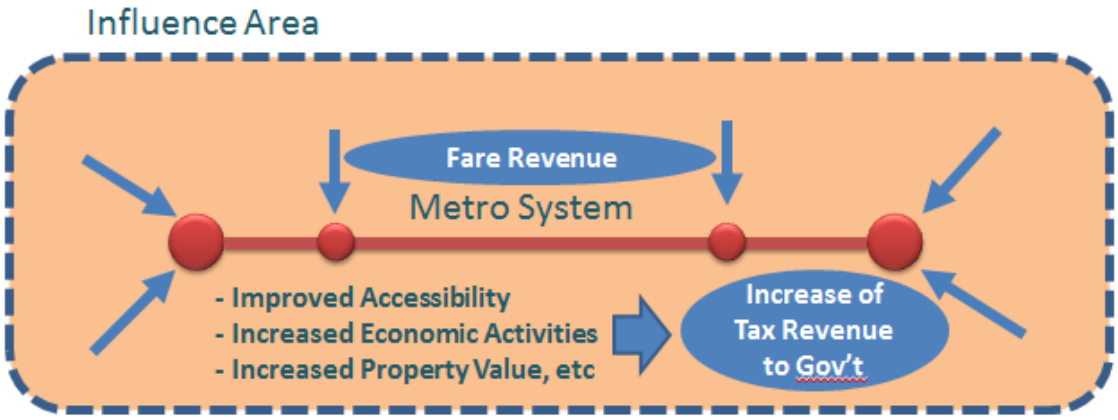


Source: JICA Study Team

Figure 9.2.3 Distribution Map of Land Price along railway lines in Tokyo Region

However, a metro project has two different kinds of benefits. As described earlier, the total benefit of the metro project is huge but the fare revenue which a metro company would directly receive is not that large. The benefit other than the fare revenue from the metro users is the activation of the economy of that area and this benefit is to be ultimately recovered by the government in the form of increased tax revenue[2] as illustrated in the following figure.

[2] Refer to Chapter 5 for details about the expected tax revenue by the metro project.



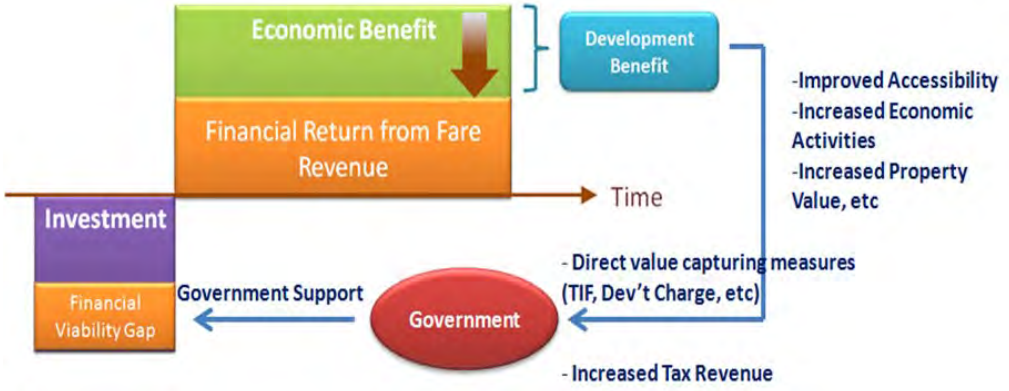
- **Fare Revenue** form Metro Users = **Direct Revenue** from Metro System => Small to cover full investment
- **Increase of Tax Revenue** to Government from Residents and Companies in the Metro Corridor
  - VAT from Property and other Business Transactions
  - Land related Tax and Fee
  - Corporate Income Tax, etc

Source: JICA Study Team

Figure 9.2.4 Two Kinds of Benefit of Metro Project

Huge initial investment of metro project is difficult to be recovered through only the direct fare revenue from the metro users, the situation in which a metro project has (Financial) Viability Gap risk. Therefore, in order to invite the private sector to participate in the metro project, the government must extend financial support for the initial investment ("extend viability gap funding" in PPP term), considering future recovery of this huge viability gap funding through the expected benefit. Increased tax revenue in the future is the primary source of this investment recovery and application of various value capturing methods are the secondary source of the investment recovery.

In any means, the government must finance most of the initial investments of the metro PPP project. The government should not heavily depend on the funding from overseas such as ODA money which has potential foreign exchange risk, but should consider how much of that huge initial investment, including the increased tax revenue in the future, could be financed by domestic funding sources in a responsible manner.

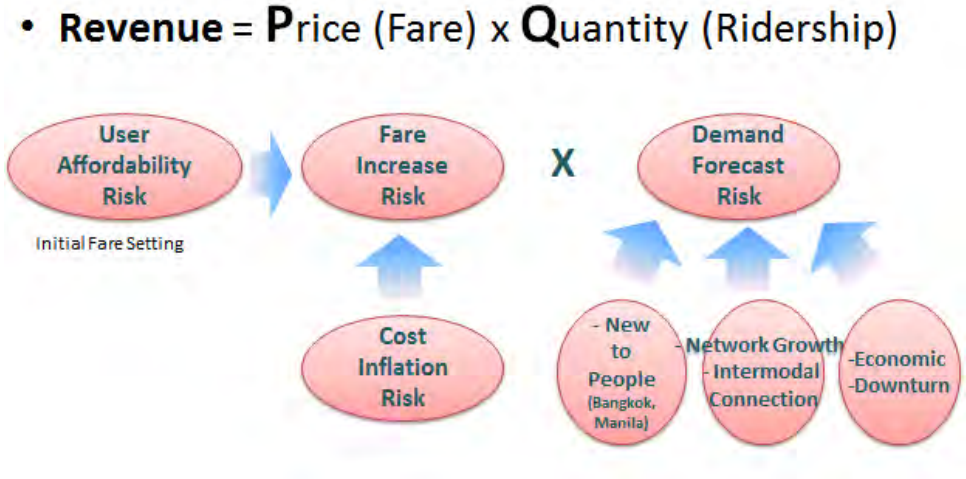


Source: JICA Study Team

Figure 9.2.5 Government Support for Viability Gap Risk and Value Capturing of Development Benefit

9.2.3 Revenue Risk

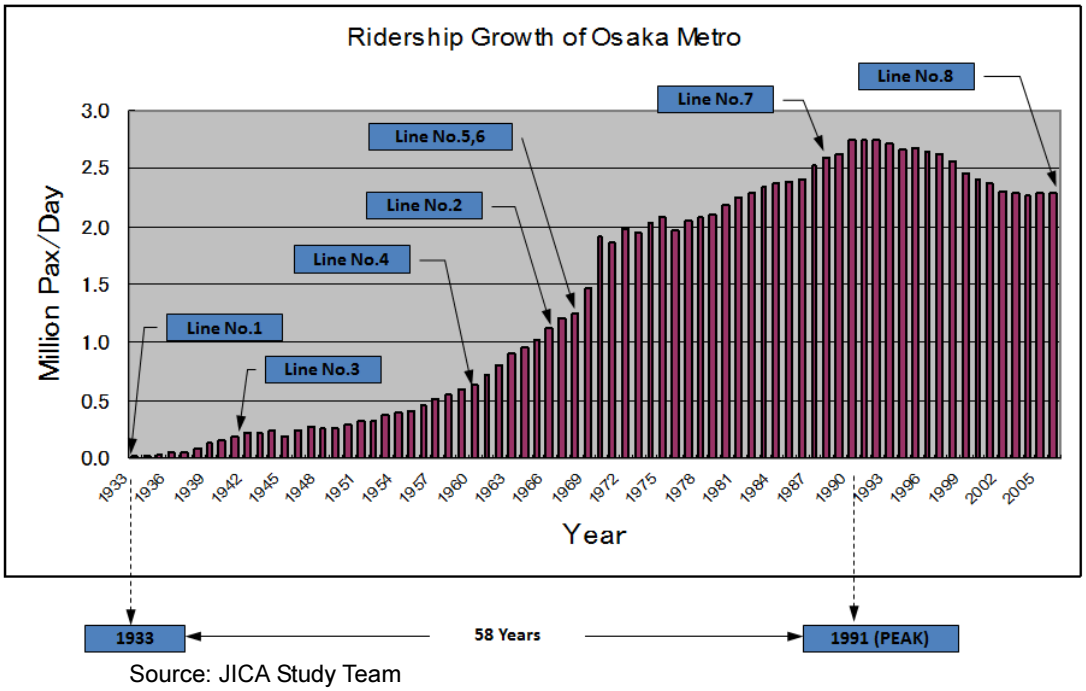
The second important thing is the management of revenue risk. As illustrated in the following figure, revenue is calculated by multiplying P (Price: Fare) with Q (Quantity: Number of users). The change in revenue, however, is affected by various factors. In the first place, there is a risk of initial fare setting considering affordability of metro users. This risk is about whether the user could pay the fare level set by metro company without problem or not. To mitigate this risk, various detailed analyses should be taken into consideration such as comparison analysis of metro fare levels among neighboring countries, survey on willingness to pay for potential metro users, comparison of the current bus fare level, ridership forecast simulation based on the time value, and so on. If the fare level could not be increased as scheduled, constant cost increase based on inflation would eat up profit and a severe business problem would occur. There is also a risk of ramping up ridership as the metro is a completely new transport mode to people (it means that ridership forecast based on the past trend is impossible). Bad linkage and connection with other public transport modes and networks could give negative effects to the growth of ridership while stagnant economy could slow down the growth of ridership, etc. As such, revenue risk is a very complex project risk which could be affected by various factors.



Source: JICA Study Team

Figure 9.2.6 Revenue Risk of Metro Project

The following figure shows the increase of ridership of Osaka Metro in Japan. The ridership growth is illustrated as the first line is connected with other newlines (as the network was being formulated). Osaka Metro had taken 60 years to formulate and mature its metro network. In a similar manner, connection of UB metro with Bus Rapid Transit (BRT) and feeder bus routes, and development of inter modal facilities at the metro stations could be closely related with the network formulation and the revenue risk of the UB metro.



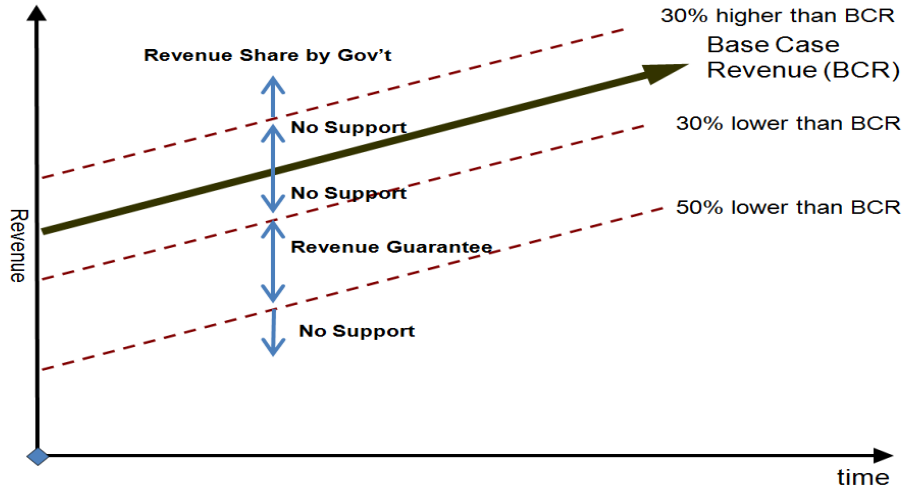
Source: JICA Study Team

Figure 9.2.7 Transition of Network Formulation and Growth of Ridership for Osaka Metro

Popular risk mitigation measure for this complex revenue risk of a green field metro project for the sake of private investors is a Minimum Revenue Guarantee Mechanism. As illustrated in the Figure 9.2.8, Base Case Revenue (BCR) line is set on the basis of base case ridership forecast which is agreed between the public and the private. If actual revenue is lower than 30%[3] from BCR, the government guarantee is triggered to make compensation payment for the insufficient amount to SPC.

There are also other risk mitigation measures such as property development rights along the metro line, subsidy mechanism by the government for renewal investment by SPC, and so on.

[3] BCR is generally set for a certain period such as 10 years since the commencement of the operations because the amount is decided based on the standard which covers at least the amount of debt service and the minimum revenue guarantee is a mechanism to cover risks when the business starts up. In the case of highway and urban railway projects on Korea, BCR started with 20% (the government takes more risks) and it finally reached 30% through trials and errors.



Source: JICA Study Team

Figure 9.2.8 Minimum Revenue Guarantee Scheme

9.2.4 Country Risk

The country risk of this project is explained in this section. Country rating of foreign currency borrowing for Mongolia is currently Single B 1. As explained in the footnote of the following table, this rating level is four notches below the speculative rating, which means that this is the level at which foreign currency commercial loan from overseas is very difficult to be given especially to domestic currency revenue generating projects in Mongolia.

With this kind of country rating, it is necessary for domestic currency generating projects like the metro project to procure long term financing in foreign currency to cover the project risks by getting various support and risk covering measures from creditworthy foreign countries, loans and guarantees from International Financial Institutions (IFIs) such as World Bank and ADB and from Export Credit Agencies (ECAs) of donor countries. By doing this, international commercial banks could start examining the financing of the project.

Table 9.2.1 Country Rating of Foreign Currency Borrowing for Mongolia

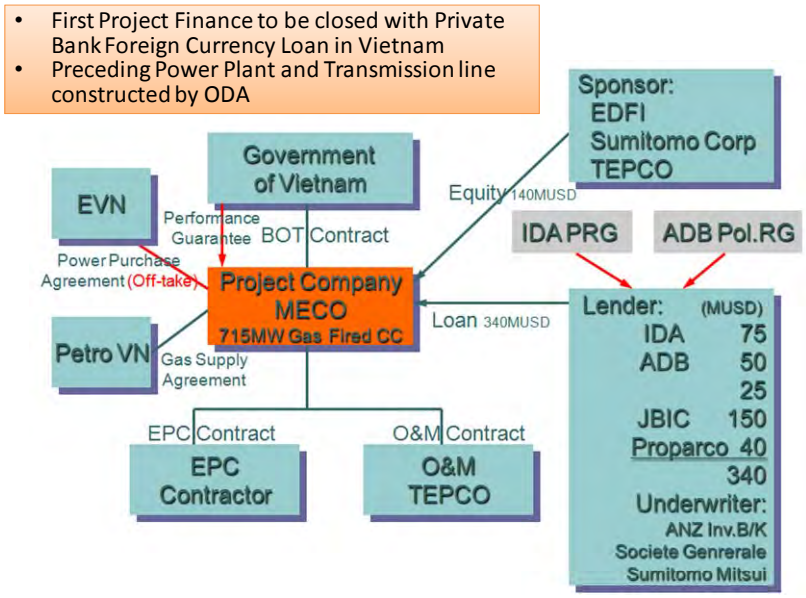
Country	Country Rating (Moody's 2012.2.13)	GNI /Capita (2010 in US$)
China	Aa3	7,640
Korea	A1	29,010
Russia	Baa1	19,190
Kazakhstan	Baa2	10,770
India	Baa3	3,550
Mongolia	B1	3,670
Ukraine	B2	6,620
Vietnam	B1	3,070

Note: Aaa>Aa>A>Baa>Speculative>Ba>B>Caa>Ca>C (1>2>3)

Source: JICA Study Team

An example of such country risk covering for commercial financing is shown in the following figure, which shows the first power generating project in Vietnam successfully procuring long term commercial project finance loans in foreign currency. As illustrated in the figure, World

Bank, ADB, JBIC and Proparco extended long term loans and guarantees, but only 10% of the total debt was able to be financed by the commercial loan. Mongolia has the same rating as Vietnam, thus it is necessary to structure the finance in similar manner of country risk covering in order to procure long term project finance commercial loan in foreign currency.



Source: JICA Study Team

Figure 9.2.9 Example of Country Risk Cover in Structuring Project Finance (BOT type power generation project in Vietnam)

There are various finances, insurances and guarantees of different IFIs and ECAs as shown in the following table for covering political risk (such as foreign exchange regulation, change of law/regulation, expropriation, requisition, nationalization, general strike, civil war, war, breach of contract and obligation by government owned entity, etc), a part of country risk.

Table 9.2.2 Support Programs of IFIs and ECAs

Major Support Programs by ECAs for Infrastructure Development Project in Developing Countries

	Name of the Organization	Category	Support Program				
			Equity	Loan	Investment Insurance	Loan Guarantee /Insurance	Coverage of guarantee/insurance
ADB	Asian Development Bank	International Financial Institutions	O	O	O	O (Guarantee)	◆ Political risk guarantee and partial credit guarantee ◆ Political risk guarantee covering four major political risk (*)
MIGA	Multilateral Investment Guarantee Agency	International Financial Institutions			O	O (Guarantee)	◆ Political risk guarantee covering four major political risk (*)
IFC	International Finance Corporation	International Financial Institutions	O	O		O (Guarantee)	◆ Partial risk guarantee
OPIC	Overseas Private Investment Corporation	Export Credit Agencies (US)		O	O	O (Insurance)	◆ Political risk insurance ◆ Covering political violence, expropriation /nationalization, regulation on transfer or exchange of foreign currencies, generally
JBIC	Japan Bank for International Cooperation	Export Credit Agencies (Japan)	O	O	(**)	O (Guarantee)	◆ Political risk guarantee is common in project finance. ◆ Covering four major political risk
NEXI	Nippon Export and Investment Insurance	Export Credit Agencies (Japan)			O	O (Insurance)	◆ Loan insurance covering credit risk in addition to political risk ◆ Covering four major political risk

(*) ①Political violence such as War and Civil-war (although coverage depends on agencies, ②Expropriation/ nationalization, ③Regulation on transfer or exchange of foreign currencies, ④Breach of contract (whose coverage depends on agencies)
(**) As for the equity back finance, "Political risk immunized" loan program is available which indulgence of loan repayment when nonpayment of dividend occurs.

Source: Integrated by JICA Study Team

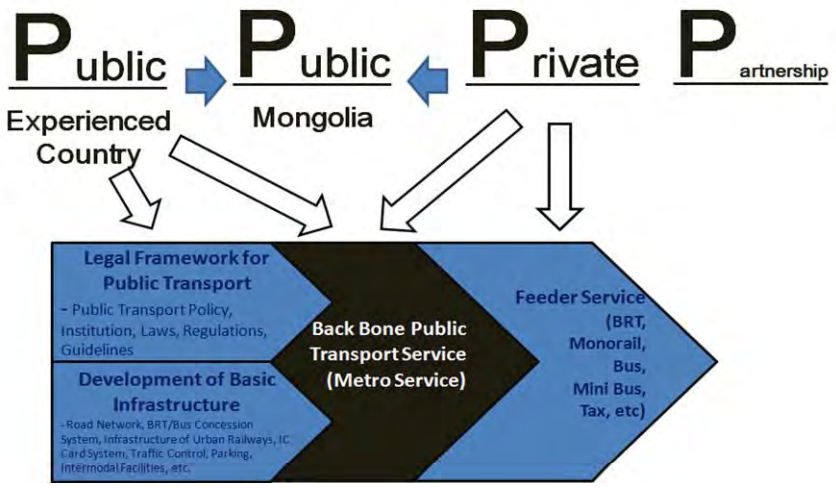
9.2.5 Foreign Exchange Risk

Metro project is a domestic currency revenue generating project. If the project procures foreign currency financing, foreign exchange risk must be considered in repayment of that financing. There exists foreign exchange risk also in procuring equipment and rolling stock which are often manufactured abroad. Depreciation rate of MNT against JPY is about 7% per annum in the last 10 years, and against USD at about 2% per annum. This is foreign exchange risk. In order to mitigate this risk, the following measures may be adopted: i) lending loan with premium interest in domestic currency of local bank which is back financed by foreign banks in foreign currency for the same project; ii) utilization of NEXI's foreign exchange insurance; and iii) utilization of a domestic currency loan from Development Bank of Mongolia.

9.2.6 Regulatory Framework Risk

Another important risk is regulatory framework risk. As the metro project is initiated and controlled by the public sector, the following expertise and know-how must be required from the public sector side, as illustrated in Figure 9.2.10 : (i) Legal framework (public transport policy and institutional/organizational frameworks in which the metro project is appropriately positioned, necessary set of laws, regulations, standards and guidelines); and (ii) Basic infrastructure development (road network considering public transport, development of necessary infrastructure for BRT, bus route network, urban railway infrastructure, common IC card system, traffic management system, a parking system, intermodal facilities, etc).

However, the metro project is very new to Mongolia, thus no such expertise and know-how in the public sector of Mongolia can be expected. This is considered a large project risk to the private sector. Therefore, it is essential to mitigate this risk for the Mongolian Government to form a strategic partnership with the public sector of metro experienced country, thus the metro project is considered as PPPP (Public, Public and Private Partnership) project.



Source: JICA Study Team

Figure 9.2.10 Metro Project is PPPP

Another regulatory framework risk is the immature development of implementation system and capability for a PPP project on the government side. In order to implement a PPP project, sufficient accumulation of various specific expertise and human resources are essential on the public side such as expertise in project structuring, tender preparation, contract negotiation and

so on. At least ten (10) years may be necessary to develop such expertise and implementation system in the government considering the time the experienced countries such as UK and Japan spent for developing their capabilities.

In order to mitigate such risk in Mongolia, at least the following technical and financial assistances from the metro and PPP experienced country should be provided:

(i) Formulation of a road map for developing regulatory framework and implementation system/ human resources
(ii) On the basis of above development, necessary expertise and human resources development
(iii) Implementation of activities in accordance with the road map and plans above possibly by sector wise and local government wise, especially UB City
(iv) Preparation of basic guidelines for task process and for specific subject
(v) Preparation of standard contract and guidelines
(vi) Policy, guidelines and methodology for viability gap funding and procurement method for funding resources

By all means, formation of a strategic partnership with the public side of the experienced country is a prerequisite for mitigating such regulatory framework risk.

The above mentioned risk mitigation and management measures are essential to implement the metro project in Mongolia. However, the details of each risk mitigation measure could vary depending on the kind of project scheme and project implementation body is adopted. The risk mitigation measures mentioned in this section are described on the basis of "UB Metro Public Corporation (UBMC)[4]" scheme which is proposed in this study.

9.3 Examination of Risk Allocation and Risk Management Measures for Important Risks

9.3.1 Common Risks

The first thing to be formulated in this process is a Risk Matrix as illustrated in the succeeding tables. These tables explained in this section present the outline of the actually used risk matrix which is more detailed and complex. The tables are prepared on the basis of common project and phase wise project risks. For each individual risk, major risk managers and minor risk managers are specified among the stakeholders (Government, SPC, Sponsor, Lender, Insurer and Contractor). By looking at these risk allocations, it is obvious that besides political risks, various project risks in different project phases need to be covered and assumed by the government in order to make a PPP project to become a feasible project.

In the farthest right column, risk management measures and related contracts are specified for each specific risk.

In the common risk, political risk, socio-environmental risk, and force majeure risk are important risks which the government assumes.

[4] For details about the UBMC, refer to Chapters 7 and 8.

Table 9.3.1 Common Risks

Phase	Risk		Contents	Stakeholders						Related Contracts/Risk Hedging Measures
				Government	SPC	Sponsors	Lenders	Insurance	Contractors	
Common Risk	Political Risk	Regulatory Framework Risk	PPP law, Concession Law	●						-Establishment of PPP Unit, Provision of TA -Dispute Resolution Mechanism -Political Risk Insurance -Involvement of IFIs, ODA Donors
		Political Risk	Change of Regime, National Assembly Approval	●				▲		
		Regulation /Permit Risk/	Change of Related Regulation/Permit	●				▲		
		Change in law Risk	Change of Tax Rate, New Tax	●				▲		
		Government Support Risk	Non Performance of Government Support	●				▲		
			Not able to cover Viability Gap	●						
	Economic Risk	Price Risk	Inflation/Deflation		●					Timely Increase of Fare
		Interest Risk	Increase of Interest		●		●			Interest Swap, etc.
		Foreign Exchange Risk	Fluctuation of FX Rate		●		●			On Lending Scheme in Local Currency
		Finance Risk	Equity, Debt, Guarantee, Bond, etc.		●	(●)	●			Use of ECA, IFI, ODA
	Social Risk	Resident Problem Risk	Opposition by Residents, Lawsuit	●	▲					Basic Agreement by Government
		Environmental Risk	Pollution, Contamination, Lawsuit	●	▲					Basic Agreement by Government
	Partner Risk	Partner Risk	Trustworthiness of Management, Contract Fulfillment Capacity		●	(●)	▲			Take over clause in Shareholders agreement, etc.
	Force Majeure	Force Majeure	Large Earth Quake, etc.	●	▲		▲	▲	▲	Waiver clause for FM, Damage insurance

Source: JICA Study Team

9.3.2 Risks in Planning Phase

A major risk manager in the planning phase is the SPC[5] for the project. However, the government needs to assume the risks of planning change and designing change by itself.

[5] This study proposes a public company (Ulaanbaatar Metro Authority: UBMA) as the in charge of the operations.

Table 9.3.2 Risks in Planning Phase

Phase	Risk		Contents	Stakeholders						Related Contracts/Risk Hedging Measures
				Government	SPC	Sponsors	Lenders	Insurance	Contractors	
Planning Phase	Planning Risk	Survey/Study Risk	Failure and insufficient topographic, geological surveys		●				(●)	Full Turn Key of EPC contract
		Design Risk	Design Change due to Design Failure	▲	●				(●)	Same as above, Thorough discussion before the start of construction
		Change of Plan, Delay Risk	Plan Change, Delay due to Environmental Assessment, Public Hearing	●	▲					Compensation for the Change, Delay Cost
		Tender Risk	Burden of Expenses	▲	●					Compensation, Reward to Runner Ups

Source: JICA Study Team

9.3.3 Risks in Construction Phase

In the construction phase, the major risks that the government needs to assume are land acquisition risk and related facility development risk. For the metro project, delay in the development of an access route to stations and intermodal facilities are critical risks which would negatively affect the growth of ridership.

Table 9.3.3 Risks in Construction Phase

Phase	Risk		Contents	Stakeholders						Related Contracts/Risk Hedging Measures
				Government	SPC	Sponsors	Lenders	Insurance	Contractors	
Construction Phase	Construction Risk	Land Acquisition Risk	Land Purchase/Acquisition risk	●	(●)					Additional Acquisition for Business is assumed by SPC
		Related Facility Development Risk	Delay in Construction of Access to Station, etc.	●						Government Guarantee and Undertaking (GGU)
		Delay in Completion	Delay in Construction Completion		●	(●)		▲	(●)	Fixed Price, Date Certain, Full Turn Key EPC contract, Liquidated damage clause
		Cost Overrun Risk	Increase in Construction Cost		●	(●)		▲	(●)	
		Performance Risk	Inconsistency with Required specification		●				(●)	
		Facility Damage Risk	Accident, Fire in Construction		●			▲	(●)	Damage/Fire Insurance

Source: JICA Study Team

9.3.4 Risks in Operation Phase

One of the identified risks in the operation phase which would affect the operation of SPC is the fare increase risk. SPC cannot raise the fare as it is scheduled under unavoidable circumstances, although it is stated in the contract. In addition, negative effects are seen due to problems in making adjustments among regulators, policy makers and others (for example, MRT, Railway Department, UB City, Public Transport Department of UB City, etc).

Revenue risk is a complex risk which is materialized and affected by different factors as explained in the later section, thus often unable to be controlled by the private sector. Therefore, it is often difficult to assume 100% risk by private sector, so a risk sharing mechanism between the public and the private is often adopted as in the experienced countries.

Table 9.3.4 Risk in Operation Phase

Phase	Risk		Contents	Stakeholders						Related Contracts/Risk Hedging Measures
				Government	SPC	Sponsors	Lenders	Insurance	Contractors	
Operation Phase	Competition Risk	Related Competing Mode Risk	Delay in Reorganization of Competing Bus, BRT Routes, etc	●						Government Guarantee and Undertaking (GGU)
	Market Risk	Ridership Forecast Risk	Forecast Related Risk	▲	●		▲			Minimum Revenue Guarantee
		Fare Risk	Fare Increase Risk	●						Minimum Revenue Guarantee
	O&M Risk	Operation Cost Risk	Cost Increase in O&M and Management Costs		●					Performance based O&M contract
		Facility Damage Risk	Damage by Accident, Fire, etc.		●			▲		Damage/Fire Insurance
	Public Organization Risk	Poor Gov't Coordination Risk	Poor Coordination between Central and Local Governments	●						Government Guarantee and Undertaking (GGU)
	Contract Default	Default Risk	Treatment of Contract Default by Reason	▲	●	(●)	▲	▲		Lender's Step In, Transfer of Project to Public Sector, etc.

Source: JICA Study Team

9.3.5 Risk Management Issues for the UB Metro Corporation based on the Two-tiered System

The following are specific issues for risk management of the proposed UB Metro Corporation (UBMC) based on the two-tiered system. These issues are needed to be considered when private investors negotiate and enter into agreement with the Mongolian government:

(1) Project Contract and Formulation of Public Corporation based on the Two-tiered System

A basic assumption of the two-tiered system is to construct the infrastructure portion using the public fund (with huge Viability Gap Funding of which the government is responsible) and to cover operating expenses and additional investment by operating revenues as much as possible to implement the metro operation independently. The operation portion of the metro then aims to become a "corporation form" in order to cover "total expenses" by "revenue", and along the process (i) to expand revenue autonomously, (ii) to save expenses efficiently, and (iii) to generate profit, to achieve economic efficiency of the metro operations.

Therefore, notwithstanding the UBMC with major shareholding owned by the Mongolian Government, risk management based on the above mentioned principles of the two-tiered system is necessary to be pursued. It is also essential to prepare the contractual arrangement for the UBMC in order to secure the sustainable company management and operations based on independence and self-sustainability.

Furthermore, there may be many conditions to be agreed between the Mongolian Government and the UBMC, thus a specific project agreement regarding the metro operation and management should be entered into between the government and the UBMC, in addition to the legal establishment procedure of the company.

(2) Agreement of Government Guarantee and Undertaking (GGU)

If the UBMC is to be operated and managed independently and autonomously and to secure the financial sustainability based on the two-tiered system, it is essential to have an agreement with the Government Guarantee and Undertaking (GGU) which requires government support for critical risks of the company management and operations of the UBMC. The purpose of the agreement is to stipulate and secure the supports and guarantees from the Mongolian Government about the risks which UBMC is unable to manage and control such as financing risk for the infrastructure portion, demand (ridership) risk, foreign exchange risk, political risk, force majeure risk and so on. Details will be discussed in the following section of the Security Package.

(3) Formulation of Financing Based on the Two-tiered System

Since the basic assumption of the financing for the infrastructure portion is to utilize the public funds including ODA fund, without viability of such public funding, no commitment by financier will be secured for E & M portion including the rolling stock which is obligated by the UBMC. To this end, prior to the formulation of financing on the UBMC side, it is essential to clarify and verify the necessary degree of commitment of the government for the infrastructure portion in order for the commercial (and/or JICA PSIF) lenders to provide funding for UBMC . This condition should be assumed for the negotiation and contractual arrangement with Mongolian Government for financing the E&M portion obligated by the UBMC.

(4) Management of Construction for the Two-tiered System

One of the critical risks pertaining to the two-tiered system is that the efficient operation and management would be hindered by the Metro's hardware facilities (the infrastructure portion) for which the intention and know-how of the private sector has not been effectively reflected. It is essential for the UBMC to secure such a position as its intention is appropriately incorporated in the design, construction and construction supervision of the infrastructure portion. Regarding the procurement of advisors for the design, construction and construction supervision, besides the one for the infrastructure portion which is to be constructed using the public fund, an in-house advisor should be procured specifically for the UBMC who could comprehensively manage the design and construction process of the Metro development on the basis of the Strategic Partner agreement.

(5) Management of Completion Risk for the Government Portion

If the completion for the construction of the infrastructure portion through the government funding is delayed, the scheduled generation of revenue by the UBMC would also be delayed and in turn affect the cash flow of the UBMC to a large extent. Therefore, this risk of the delay in the completion must be managed very stringently. To cover the risk caused by the government, Liquidated Damage Penalty Payment mechanism and compensation payment for the material delay and so on must be stipulated. Furthermore, it is generally practiced in the contractual arrangement that appropriate compensation conditions for the damage of the UBMC caused by the government should be stipulated. These cases must be thoroughly examined and discussed with the government to be included in the project contract.

(6) Organizing SPC (UB Metro Corporation)

Regarding the establishment of UBMC, it would be preferable in terms of the accumulation of know-how to first establish specific "Task Force for UB Metro Preparation" or "UB Metro Preparation Unit" inside the UB City Government. Then the major members of the Unit are to be transferred to the UBMC as its core members. The private sector strategic partner would enter into the strategic partner agreement with this UB Metro Preparation Unit, and support the Unit in all aspects of the Metro preparation. They would then participate in the UB Metro Corporation as major shareholders when the Unit transferred to the UBMC. Eventually, each specific expertise of the Metro project (such as design, construction, procurement, construction supervision, opening, operation, maintenance, etc.) enters into the advisory agreement with the UBMC.

(7) Fare Revision Risk

Revision of fare (timing and level) must be stipulated in the project contract entered into between the Mongolian Government and the UBMC because the revision of fare could not sometimes be controlled by the UBMC alone due to political reasons and others. It is also necessary to stipulate in the project contract specific compensation conditions if such fare revision risk is to be materialized due to the reasons of the government.

(8) Application of Minimum Revenue Guarantee Mechanism

Revenue risk occurs with the combination of the complicated causes and it is specifically difficult to control during the launching period of the metro business. In case of two-tiered system, it seems extremely difficult for the UBMC to procure commercial financing for its procurement of rolling stock without the application of some kind of the minimum revenue guarantee mechanism at least during the initial phase of the operation especially if it is a green field metro project and the first metro project in the country. Therefore, it is preferable for the Mongolian Government to examine thoroughly the possibility of applying this mechanism from the beginning. The mechanism is outlined in 9.2.2.

(9) Subsidy Mechanism for Additional Investment

The implementation mechanism proposed in this report is a mechanism to minimize the provision of subsidy from the Mongolian Government to the UBMC. However, it is necessary to examine and prepare also a subsidy provision mechanism at least for the risk of additional investment (addition of rolling stock, renewal of facilities, etc.) which is the most critical risk for the cash flow of the UBMC in the future.

(10) Establishment of Bank Account to earmark Infrastructure Usage (Lease) Fee

It is preferable to pool the payment of the infrastructure usage (Lease) fee which is to be paid by the UBMC to the Mongolian Government, the owner of the Infrastructure. It is also preferred that the payment is managed under the responsibility of the public. The pooled fund should be used for the purpose of the compensation payment for the risk caused by the Government, the

subsidy payment for additional investment by the UBMC with certain conditions and so on.

(11) Adjustment with Station Plaza Development

It is necessary to have a master plan for the district development which is to be prepared by the public side, for the adjustment of the station plaza development along the Metro corridor. This master plan should include the connection function of inter-modal facilities, coordination with BRT and trunk bus routes as basic conditions for the adjustment. It is preferable that UB City government initiate the tender for the development of the station plaza area on the basis of the master plan. UB Metro Corporation must participate in the implementation of these master plans and the evaluation committee of such tenders in order to incorporate the proper intentions of the UBMC to the station plaza development along the Metro corridor.

Therefore it is preferable that this kind of master plan of the station plaza development should be prepared prior to the establishment and project contract of UB Metro Corporation.

(12) Adjustment for the Risks of Initial Phase of Operation

Various project risks are expected in the initial phase of operation. Especially if the project is a green field metro project and the first one in Mongolia, many things may not be materialized as assumed. It may be worthwhile to examine an adjustment mechanism for the risks in the initial phase of the operation in which the risk adjustment (renegotiation of contract conditions including the finance) is to be made after both parties experience the first year of operation. However, in such cases, the procurement of purely commercial financing may be difficult, thus much more involvement of the public and more elaborated financing structure may be necessary.

9.4 Security Package

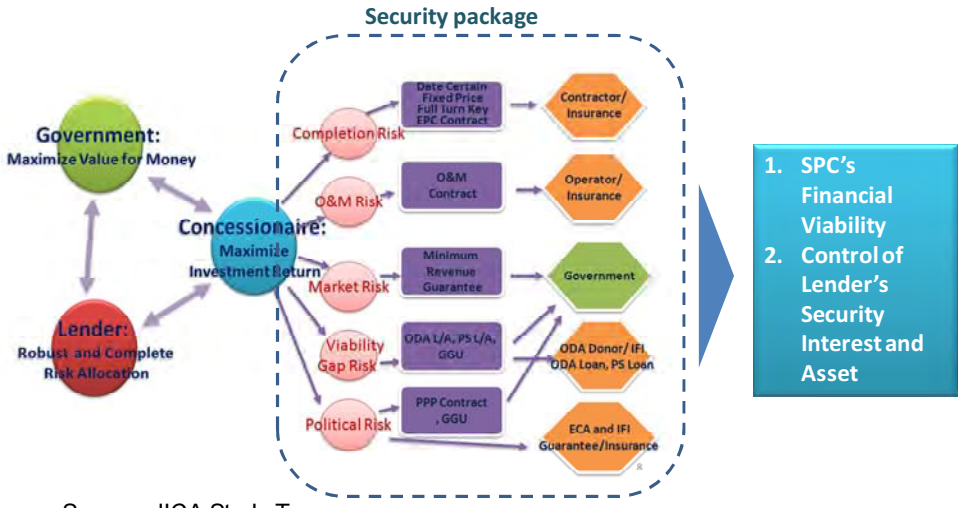
9.4.1 What is security package?

In this section, the formulation of a security package is described, which integrates the results of the risk analyses and risk management, and ultimately connect with successful financing of the project.

Examination of a security package in this section is conducted on the basis of applying “UB Metro Public Corporation” scheme to the project with partly foreign currency project finance loans to finance the project.

Security package is an aggregate of necessary contracts, guarantees, security and other agreements which are based on the result of risk analyses, analyses of management measures and risk allocation. This package also aims to secure the viability of SPC’s business and control of project related assets and rights for loans provided by the lenders.

As explained earlier, an aggregate of contracts, guarantees and other agreements surrounded by the dotted line in the following figure is called a security package. This is made based on the result of risk allocation and management among the three major stakeholders for implementing a PPP project.



Source: JICA Study Team

Figure 9.4.1 Contents of Security Package

9.4.2 Preparation of Security Package

Security package to be examined in this section is composed of two layers as follows: (i) First Tier: to secure the viability of business conducted by SPC (meaning "UB Metro Public Corporation," same hereafter); (ii) Second Tier: to manage and control the project related assets/rights and cash flow for the lender.

However, contents and composition of this security package may differ depending on the kinds of finances which this UB Metro Public Corporation would procure for the project. Therefore, the contents and composition of this security package would be finalized when the financing structure is finally determined.

The First Tier of the security package is, as described in the following table, a package for securing the SPC's viability, which is based on the project scheme structured as a result of the risk analyses. Its contents include a number of guarantees and agreements entered into by the related stakeholders. It is the package of SPC's rights and guarantees for implementing a PPP project in a robust manner. Majority of the package consist of contracts and guarantees between SPC and related stakeholders, especially those between SPC and the public sector in the form of PPP project agreement and Government Guarantee and Undertaking (GGU). GGU is an agreement form of government guarantees and various incentives regarding the implementation of the PPP project.

Table 9.4.1 Outline of Security Package (1st Tier)

Type	Contract	Description	Issues/Notes
Government guarantees			
• Currency conversion	GGU	The SPC's right to make currency conversion from MNT based toll revenue to Foreign Currency.	
• Profit remittance	GGU or PPP Agreement (PPPA)**	The SPC's right to remit profits overseas.	
• No nationalization	GGU or PPPA	Assets of the SPC will not be nationalized. Full compensation will be paid if such case occurs.	
• No other taxes	GGU or PPPA	The SPC will not be affected by negative tax changes and has the	Government may not give positive benefits but open to

Type	Contract	Description	Issues/Notes
		right to receive benefits from positive changes.	negotiation.
• Stability of law	GGU or PPPA	The SPC has the right to enjoy favorable changes in law and receive compensation when there are unfavorable changes in law. Specific mechanism on compensation is to be stated in GGU or PPPA.	
• Provision of infrastructure and public services	GGU or PPPA	Authorized body shall provide feeder roads and other public facilities critical to traffic demand, according to mutually agreed schedule. The SPC receives compensation from government if authorized body fails to provide agreed infrastructure. Specific mechanism on compensation is to be stated in GGU or PPPA.	
• Provision of utility infrastructures	GGU or PPPA	Basic utility infrastructures have to be provided to or available at the project site such as electricity and water.	
• Performance of contract obligation by related state owned entity	GGU or PPPA	The SPC may have the right to receive benefits from state owned entity actions stated in contract. The SPC receives compensation from government if government and/or state owned entity fails to comply with such contractual obligations. Specific mechanism on compensation is to be stated in GGU or PPPA.	
• Toll adjustment guarantee	GGU or PPPA	Authorized body shall adjust tariff according to mutually agreed adjustment mechanism. Mechanisms of reflecting changes of inflation rate and foreign currency exchange rate should be incorporated. The SPC receives compensation on loss portion if authorized body fails to comply.	Upfront discussion is necessary. Explanation of project importance shall be emphasized.
• Minimum revenue guarantee	GGU or PPPA	Government guarantees a minimum level of traffic demand converted into revenue. This applies for the initial 10years of operation when the traffic could be volatile and well below forecast. Minimum level is set to allow the SPC to stay afloat, without additional capital injection. In addition, upper limit of the SPC's revenue would be set and the SPC would pay government for the amount beyond the limit.	Upfront discussion is necessary. Explanation of project importance shall be emphasized.
• Buy-out clause	GGU or PPPA	Government's guarantee to buy-out the project, in the event of breach of contract by government (e.g. no tariff adjustment) and natural force majeure event which is not cured within agreed curing period. Method of buy-out is specified in GGU or PPPA.	Similar clause has been successfully negotiated in other Vietnam infrastructure project.
• Supplementary support from government		Supplementary support to other risk mitigation mechanisms could be required such as foreign exchange rate change.	Discussion with government is required.

Type	Contract	Description	Issues/Notes
Government Incentives and Subsidy			
• Free land rent	Investment Certificate (IC)	The SPC is exempt from the land use fee or land rent with respect to the land and the underground space on which the Metro is built.	
• Corporate income tax incentives	IC and GGU or PPPA	Exemption from corporate income tax and special treatment of depreciation	Considered for preferential investment sectors and granted on a case-to-case basis. Note that there has not been much recent relevant experience on this.
• Import duty exemption	IC and GGU or PPPA	Exemption from import duties for goods and services imported for the construction, operation and maintenance (subject to some conditions).	
• Initial land use rights acquisition and resettlement compensation	IC and GGU or PPPA	Government will be responsible for all costs related to initial land rights acquisition and resettlement compensation costs.	
• Subsidy for ancillary facilities	GGU or PPPTA	Government will provide ancillary facilities in relation to the Metro project. This includes intermodal facilities and adjustment/ reforming competing bus routes, BRT, etc.	Upfront discussion is required. Emphasize on project importance.
• No tax on profit remittances	IC and GGU or PPPA	Supplementing the right to remit.	
• Rights along Metro	GGU or PPPA	Advertising business rights and other development rights along Metro are provided to the SPC or sponsor as an incentive. Specific conditions are to be specified in GGU or PPPA.	
Sponsor support			
• Guarantee of capital contribution up to completion	Sponsor support agreement	Sponsor guarantees to provide required capital up to completion. This type of contribution might be provided by subordinate loan.	
• Provision of working capital	Sponsor support agreement	Senior lender would provide working capital facility as well in common, if required. However, when senior lenders are not able to provide this as part of the senior debt package, the sponsors might provide the working capital with subordination to the senior debt.	
• Supplementary support from sponsor		Supplementary support to other risk mitigation mechanisms could be required such as inflation and foreign exchange rate change and currency convertibility.	Discussion with sponsor is required.
Fixing loan repayment			
• Interest swap	Interest rate swap agreement	In order to avoid risk of interest rate fluctuation, the SPC will enter into interest rate swap agreement with swap provider.	
Insurance protection			
• Insurances	Insurance contracts	Protection from several risks, including additional cost or damage	

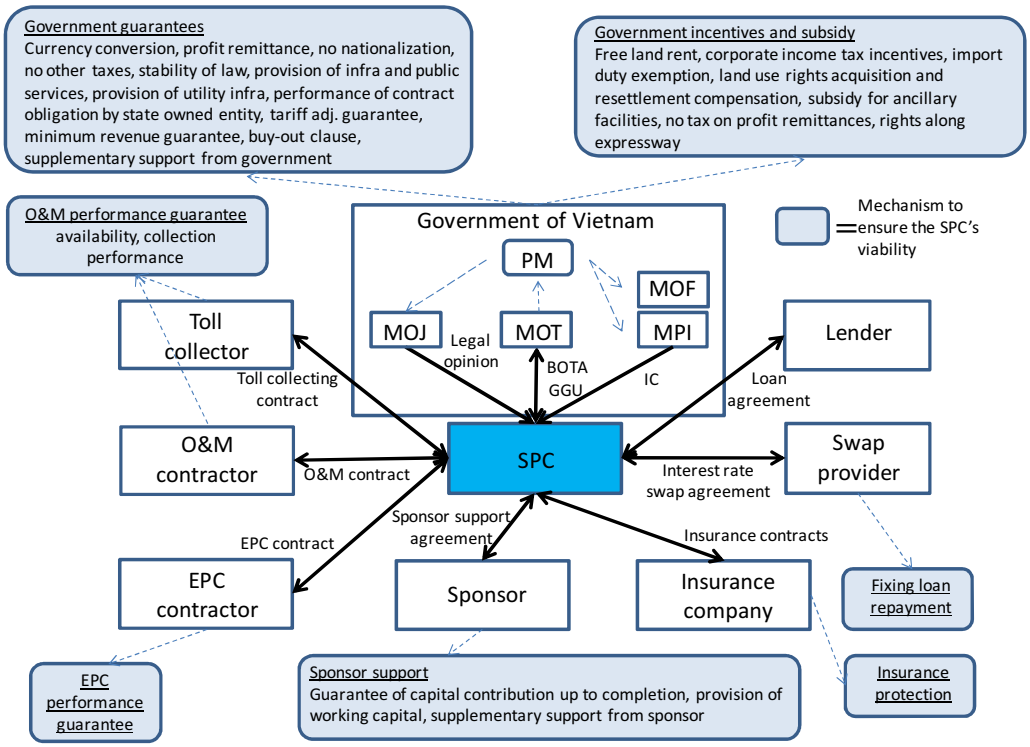
Type	Contract	Description	Issues/Notes
		caused by natural force majeure event, should be provided by insurances, such as construction insurance, property damage insurance, third-party liability insurances, etc.	
Contractor obligation			
• EPC performance obligation	EPC contract, completion bond	The EPC contract would have to include bankable provisions dealing with a number of issues including completion risk, bonds, retentions, and liquidated damages regimes.	
• O&M performance obligation	O&M contract	O&M contractor fee would be paid based on tightly defined key performance indicators on toll road availability.	

* Statements here represent the approach generally taken as modified by current circumstances. In reality, each project will be approached and documented somewhat differently.

** Where the project has a PPPA, most provisions will be contained in the PPPA and the GGU will be a shorter document covering headline issues such as government guarantees of state entities involved in the project and currency availability and conversion. Where there is no PPPA, all issues normally located in the PPPA have to be relocated to a longer GGU.

Source: JICA Study Team

The following figure is an example of a structure for the 1st Tier Security Package for privately financed expressway project in Vietnam.



Source: JICA Study Team

Figure 9.4.2 Example of Security Package Structure (1st Tier) for Expressway Project in Vietnam

The following figure shows the 2nd Tier of the security package which include agreements, security charges on assets/rights and so on in order for the lender to secure control on the rights/assets and cash flow of the project. The flow of fund could span over both Vietnam and overseas; management mechanisms for both sides are necessary. This package would ultimately be needed to conduct the step in procedures for the lender to secure all the right and assets for the project and to restructure the project when the project goes wrong in the future.

Table 9.4.2 Outline of Security Package (2nd Tier)

Type	Contract	Description	Issues/Notes
Cash control mechanism			
• Approval of account structure and cash flows	BOTA or GGU and SBV approval	The SPC will want to receive foreign currency receipts (of loans, equity, insurance proceeds etc.) into an off-shore account. It will also want to be able to pay foreign currency outgoings (including dividends, debt service and payments to foreign contractors) from this account. It will want to be able to remit revenue generated on-shore into the off-shore account (after allowing for local payments). Local MNT and foreign currency accounts will also be required. Any local payments in MNT will be managed from the MNT account. This includes MNT debt service payments to local banks and/or dividend payments to local sponsors, upon instruction from overseas offshore account waterfall account manager.	This will require a detailed step by step plan to be agreed as part of the PPPA or GGU.
• Conversion structure	Conversion bank agreement	Mechanisms and conditions for currency conversion of MNT to USD or JPY within onshore account would be agreed.	The effect of PM's instruction to guarantee conversion limited to only 30% of the revenue should be monitored closely.
• Onshore security agent structure	Agent agreement with local bank	A designated security agent will hold the security in onshore assets on behalf of the lenders. Lender syndication should ideally include local bank that will also play this agent role. If not, it is still possible to convince a local bank to play the role, if they are given some incentive (such that the local accounts are to be opened with them). Some foreign banks which have their branch office in Vietnam are playing this role in existing projects.	Unlike trust structure, this agent structure cannot cope with changes in lender syndicate, and requires changes to the documents and registrations every time such changes occur.
• Offshore security trust structure	Agreement with offshore security trustee	A designated offshore security trustee will hold the security in offshore assets on behalf of the lenders. Ideally, security trustee should be designated from one of the overseas lender syndicates. If not, it is still possible to convince a foreign bank to play the role, if they are given some incentive.	Should discuss with potential lenders how they plan to manage this.
• Cash waterfall	Loan agreement	The loan agreement will include provisions of cash waterfall. This will detail prioritized order of cash allocation among the project accounts and what may be withdrawn from those accounts.	
• Debt service reserve account	Loan agreement	The SPC will establish an offshore debt service reserve account (DSRA), which must be funded before lower ranking payments (such as profits remittance) from cash waterfall.	

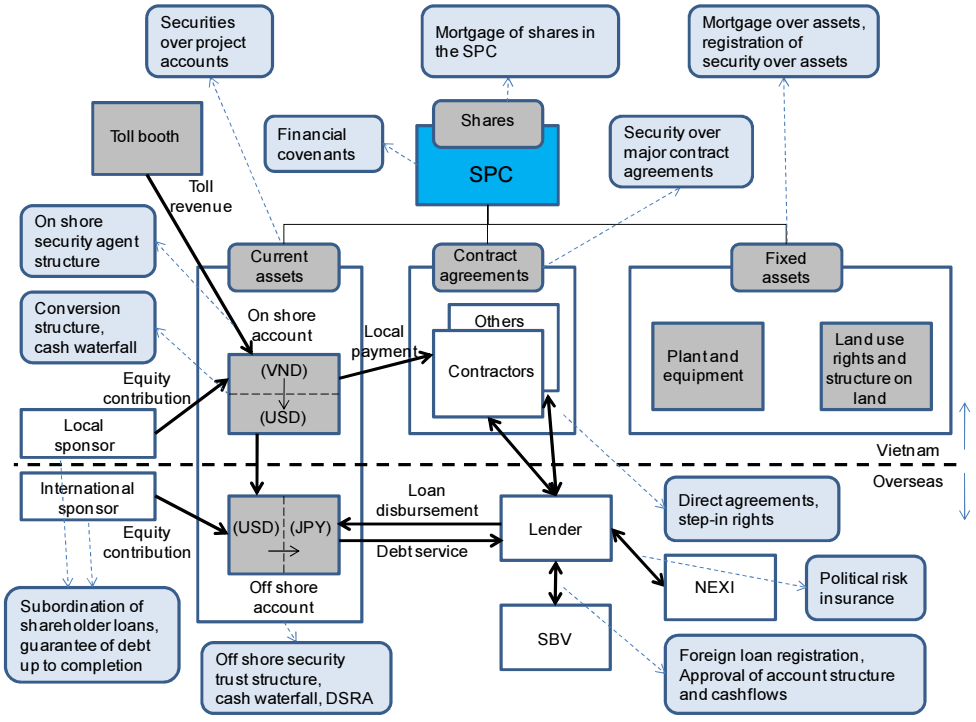
Type	Contract	Description	Issues/Notes
• Financial Covenants	Loan agreement	Loan agreement includes financial covenants such as keeping a certain number of Debt Service Coverage Ratio (DSCR) or Debt/Equity Ratio. If the SPC cannot keep these covenants, lenders can stop dividend distribution to the sponsors or announce the event of default according to the provisions of the loan agreement.	
• Subordination of shareholder loans	Shareholder loan agreement	To the extent shareholder loans to the SPC compete with the senior debt, they would have to be subordinated.	
• Guarantee of debt up to completion	Loan agreement or separate Completion Guarantee Agreement	Sponsor guarantees the debt until financial completion (generating stable operational cash flow satisfying financial covenants) occurs.	
Mortgage and Security			
• Registration of security over assets	Registration of Security Interests	Security over assets in Mongolia should be registered with the relevant registration organization to ensure priority.	
• Mortgage of shares in the SPC	Mortgage agreement between lender and each shareholder	Lender's right to retain ownership of shares in the SPC in the event of the SPC default.	It is needed to check whether approval by government is necessary on lenders' ownership of shares in addition to corporate approvals from the SPC and waivers from the sponsors.
• Mortgage over Facility plant and equipment	Mortgage agreement with the SPC	Lender's right to retain ownership of facility and equipment in the event of the SPC default.	
• Mortgage of land use rights and structure on land	Mortgage agreement with the SPC	Lender's right to retain control of land use and structures on land during the course of concession period in the event of the SPC default.	It is needed to check whether or not the law prohibits the grant of mortgages over land to foreigners.
• Security over major contract agreements	Mortgage Agreement	Lender's right to retain security over contract. In the toll road project, Toll Colleting Contract is also important in the aspect of maintaining cash flow.	
• Direct Agreements with all major project counterparties	Direct Agreement	Each mortgage of a project contract (including the GGU and the PPPA) would be accompanied by a direct agreement, including assurance not to change or terminate contract without lender's consent.	
Step-in rights	Mortgage Agreements and Direct Agreements	Lender's right to step-in and control the SPC management, in the event of non-performance or default.	In reality, most lenders prefer not to step-in because they don't want to be held responsible. Also, since the authorities will only recognize the legal representatives of the SPC, step-in rights may not be effective. Nevertheless, there is no downside in including such rights in the contract. It is important to note, however, that control and continuity of operational cash flow from fare box revenue is the most

Type	Contract	Description	Issues/Notes
			important factor and not necessarily management of the SPC entity itself.
Political risk			
• Political risk insurance	NEXI insurance package (if required by overseas lenders)	NEXI provides Overseas Untied Loan Insurance which will guarantee the payment of debt, in the case of the SPC's poor performance/default caused by political changes that negatively affect the basic operations of the SPC. Such political changes include breach of contractual obligation risk, change in law/permission risk, remittance and conversion of foreign currency risk, expropriation/nationalization risk, and political force majeure (war, civil war, terrorism, strike, etc.)	

* Statements here represent the approach generally taken as modified by current circumstances. In reality, each project will be approached and documented somewhat differently.

Source: JICA Study Team

The following figure is an example of security package structure (2nd Tier) for the expressway project in Vietnam.



Source: JICA Study Team

Figure 9.4.3 Example of Security Package Structure (2nd Tier) for Expressway Project in Vietnam

10 Economic and Financial Analysis

10 Economic and Financial Analysis

10.1 Economic Analysis

10.1.1 Objective and Method of Economic Analysis

The economic analysis is to determine whether a proposed public infrastructure project deserves investment of public monies. The concept is to analyze if the return on a project is worth the investment from the viewpoint of the national economy as a standpoint of the government and the yardstick is the Economic Internal Rate of Return (EIRR). The rationality of the investment in the project is evaluated based on the EIRR estimate by comparing the economic costs and benefits over the life of the Project, which is normally assumed to be 30 years after opening.

In general, the economic benefit of the transportation development project is defined as the savings in vehicle operation costs (VOC) and travel time costs (TTC) of users attributable to the project. The benefit is comparatively easy to quantify and is estimated through a "with-and without" comparison of traffic demand analysis.

- Metro user's benefit: reduction in vehicle operating cost (VOC) and savings in travel time cost (TTC) due to Metro use (shift from private/public transport on road to Metro).
- Road user's benefit along Metro Corridor: reduction in traffic congestion on the existing road (along Metro corridor), as can be seen in increases in travel speeds and reduction in VOCs.

10.1.2 Conditions of Economic Analysis

Economic Analysis is conducted by comparing with/without Metro, based on the condition of new roads development (proposed by UBMPS and planned by UB City) and restructuring of the bus route network (without other mass rapid transit and highways).

Basic preconditions are as follows:

- Project period: starting from 2013, opening in 2020
- Operation and maintenance cost: 1.5%/year of the total project cost
- Social Discount Ratio: as the opportunity cost of capital, 12% per annum is assumed as the social discount rate (benchmark year is 2014 when construction will start)
- Project life: 2049 after 30 years of opening
- Exchange Rate: 1 US$ = 1,700 Tg, 1 US$ = 100 Japanese Yen
- Fare system: 200Tg+(km-2)x50Tg (200Tg within 2km distance, 50Tg/ km over than 2km)

EIRR was compared under two cases below:

1) by project cost options
2) by fare system options

10.1.3 Estimation of Economic Benefit

1) VOC: Vehicle Operation Cost

The savings in VOC is one of the major sources of economic benefits in transport projects. The most important is that the VOC should be a function of vehicle speed so that the improvement of road conditions would be duly reflected as an economic benefit.

Table 10.1.1 VOC (US$/1000km)

Average Speed (km/h)	Private Transport	Public Transport
5	467.7	326.8
10	268.8	184.3
20	165.8	110.8
30	130.0	86.4
40	111.1	73.3
50	102.0	68.4
60	100.2	68.2
70	101.2	70.4
80	104.6	74.3
90	110.6	79.0

Source: JICA Study Team

2) VOT: Value of Time

The savings in passenger time cost is another major source of economic benefit of transport projects. The following table presents the unit value of time assumed by the result of the Stated Preferences (SP) survey. VOT of private transport users is more than twice that of public transport users.

Table 10.1.2 VOT (US$/h)

Year	2011	2020	2030
Private Transport	0.832	1.596	3.081
Public Transport	0.378	0.725	1.399

Source: JICA Study Team

3) Estimation of Economic Benefits

By applying the above unit costs to the results of traffic demand and summing VOC and TTC, aggregated transportation cost was estimated. Economic benefit is the difference of the aggregate costs between “with project” and “without project” cases. Table 10.1.3 shows the estimated economic benefits of benchmark years (in the case of the project costing 170 billion yen). In 2020, the opening year, about 70% of the benefit will be travel time cost savings.

Table 10.1.3 Economic Benefits of Benchmark Years

Year	Economic Benefit (mil. US$)		
	TTC Saving	VOC Saving	Total
2020	67.06	29.15	96.22
2025	259.33	30.73	290.06
2030	451.59	32.31	483.89
2031	490.04	32.62	522.66
2035	643.85	33.88	677.73
2040	836.11	35.46	871.57

Source: JICA Study Team

10.1.4 Comparison of Project Cost Option

Project costs of the following three options have been set up with the difference of procurement.

- Option 1 : the assumption that Japanese firms etc. can enter into the project (base case)
- Option 2: the assumption that international competitive bidding is conducted (competition case)

- Option 3 : the assumption that Japanese firms can enter into the main constructions and procurements (Japan core case)

As for Option 3, it is assumed that Japanese firms would get involved into civil and architectural works for the underground section (by shield method), procurements of signals and telecommunications, the safety system and rolling stock.

The coverage of economic analysis is the infrastructure including (i) all civil engineering (underground and elevated), (ii) depot, station, air condition of Electronic and Mechanical (E&M), (iii) all railway truck (installment, depot + railroad siding). EIRR was estimated based on the project costs of 1.321 billion of Option 1, .0987 billion of Option 2, and 1.111 billion of Option 3.

Table 10.1.4 Cost of Infrastructure, EIRR and NPV by Project Cost Option

		Option 1: Base case	Option 2: Competition	Option 3: Japanese core
Infrastructure cost*	(Million USD)	1,321.0	987.0	1,111.0
EIRR	(%)	17.5%	20.6%	19.3%
NPV	(Million USD)	773	1,004	917

*Infrastructure cost includes civil works, depots of E&M, stations, air conditioning and tracks.

Source: JICA Study Team

10.1.5 Comparison by Fare System

As explained in Chapter 3, a mixed fare system is proposed on the basis of the results of the traffic demand analysis, the result of a willingness to pay survey, and the current bus fare system

200 Tg + (km-2) x 50 Tg (200 Tg within 2 km, 50 Tg/km over 2 km).

Based on the project cost of Option 2: Competition Case, EIRR was estimated by each fare system and the summarized result is shown in Table 10.1.5.

As the table clearly shows, when the proposed fare system (200 Tg within 2 km, 50~70 Tg/km over 2 km) is applied, EIRR is 18.6~20.6, which means that the project is economically justified. In this case, the average fare is 426 Tg~452 Tg, but even in the case of the flat fare system with the average fare of 600 Tg, EIRR is 16.0%.

Table 10.1.5 EIRR by Each Fare System

	Fare System		No. of users (per/day)	Revenue (US$/day)	Average price (Tg/per)	Average trip length (km/trip)	EIRR
Free	0 Tg		914,904	0	0	6.0	22.6%
Flat Fare	400 Tg (same as bus)		409,521	122,856	400	8.1	18.8%
	500 Tg (bus x1.25)		310,606	118,030	500	8.6	15.1%
	600 Tg (bus x1.5)		238,600	107,370	600	9.0	16.0%
	700 Tg (bus x1.75)		176,682	93,641	700	9.6	12.1%
	800 Tg (bus x2.0)		116,665	69,999	800	10.0	5.9%
Distance-based Fare	20 Tg/km		865,424	77,888	120	5.8	25.1%
	40 Tg/km		808,746	137,487	226	5.6	24.7%
	60 Tg/km		706,864	162,579	306	5.1	22.4%
	80 Tg/km		594,090	154,463	346	4.3	17.4%
	100 Tg/km		508,238	142,307	372	3.7	14.0%
Mixed Fare	200 Tg within 2km	**200+(k-2)x50**	**486,975**	**155,832**	**426**	**6.3**	**20.6%**
		200+(k-2)x60	466,080	158,467	452	6.1	18.6%
		200+(k-2)x70	439,565	149,452	452	5.5	18.6%
	400 Tg within 4km	200+(k-4)x50	570,685	142,671	333	6.4	20.8%
		200+(k-4)x60	558,562	150,812	359	6.2	20.8%
		200+(k-4)x70	541,685	151,672	372	5.9	19.1%
	300 Tg within 4km	300+(k-4)x50	418,070	142,695	466	6.8	18.5%
		300+(k-4)x60	404,958	146,342	479	6.6	19.7%
		300+(k-4)x70	389,560	144,700	492	6.3	17.2%

Source: JICA Study Team

10.1.6 Sensitivity Analysis

The sensitivity analysis was made by changing the projected cost upward and benefit downward, or economic benefits traffic demand downward.

The following table shows the result of sensitive analysis by changing cost and benefit, targeting Option 2 Competition Case. EIRR still keeps 15% if the cost increase by 15% or the benefit decreases by 15%.

Table 10.1.6 Sensitive Analysis by Changing Cost and Benefit (Option 2)

		Project Cost Increase		
		Base (0%)	10% up	20% up
Benefit Decrease	Base (0%)	20.6%	19.6%	18.6%
	10% down	19.5%	18.5%	17.6%
	20% down	18.2%	17.3%	16.4%

Source: JICA Study Team

10.2 Financial Analysis

10.2.1 Purposes and Assumptions of Financial Analysis

(1) Objectives and Methodology

This section conducts cash flow analysis to evaluate the project's financial viability. This study, as discussed in Chapter 7 and 8, proposes the establishment of a public company "Ulaanbaatar Metro Corporation (UBMC)," which would be in charge of operations on the assumption of the two-tiered system. Firstly, cash flow analysis of the overall metro project (project cost: US$ 1.5 billion) is conducted and the profitability of the project is examined. Secondly, cash flow analysis of the UBMC is conducted in case that the UBMC would make an investment in a part of E&M, rolling stock and related facilities as well as in inauguration expenses—approximately US$200 million out of the US$1.5 billion construction costs. A part of the revenue from passenger fares would be paid as a rental fee to the government, the actual owner of the infrastructure.

Evaluation indicators are Project Internal Rate of Return (PIRR) and Equity Internal Rate of Return (Equity IRR)[1].

(2) Assumptions

The analysis was conducted based on the following assumptions.

1) Period of analysis

It is planned that the construction will start in 2013 and the UBMA will start operation in 2021. Therefore, this analysis covers the construction period from 2013 to 2020 and the operation period from 2021 to 2040.

2) Investment cost

Investment cost is divided into two parts based on the two-tiered system: (i) the lower portion: infrastructure (fundamental structures) owned by the government and (ii) the upper portion: project cost borne by SPC (UBMC). The following are the investment cost based on the project cost estimated in Chapter 4 and operating and opening costs in Chapter 8.

(i) The lower portion: Infrastructure cost

- Civil Works (Underground and Elevated): MNT 1,367 billion
- E&M: MNT 410 billion
- Track: MNT 98 billion
- Others (design, preparation work, land, etc.): MNT 205 billion

(ii) The upper portion: Project cost of UBMC

a) Construction cost

The following costs are to be borne by the UBMC in accordance with the Railway Transportation Law which specifies that fundamental structures shall be owned by the government. With regard to the maintenance of the depot, 25 million USD is expected to be additionally spent as heavy maintenance[2] costs in 2023.

[1] Equity IRR is a converted quantity of future return to the capital as an annual rate of interest. It is also defined as a discount rate at which the present value of all future cash flow is equal to the initial investment. To avoid confusion with Economic IRR (EIRR), this section mentions it as Equity IRR.

[2] Heavy maintenance is a check or inspection with disassembly.

- E&M: maintenance of the depot: 6 billion MNT
- E&M: stations (ticket vending machines and ticket gates etc.): 32 billion MNT
- Rolling stock and related equipment: 179 billion MNT
- Design（6% of the above cost): 13 billion MNT

b) Opening expenses

The opening expenses are calculated on the basis of the work plan indicated in Section 8.4, Chapter 8.

- Labor cost: 61.6 billion MNT (Japanese: 41.6 billion MNT, Mongolia: 20 billion MNT)
- Training in Japan: 2.6 billion MNT
- Head office expense: 11.2 billion MNT
- Maintenance cost: 11.4 billion MNT
- Power cost: 4 billion MNT

3) Useful life of depreciable assets

Depreciable assets of the investment by the UBMC are civil works, railway track, E&M, and rolling stock. In Mongolia, the corporate income tax law stipulates the useful life of fixed assets but those kind of assets are not specifically mentioned. Consequently, those two assets seem to be categorized in other fixed assets whose period of use under the law is 10 years. This study adopts the Japanese standard, which specifies that the useful life of civil works is 40 years, railway track is 30 years, E&M and rolling stock are respectively 15 years and 20 years since the development of the metro is the first urban railway project in Mongolia.

4) Operational cost and a infra-rent fee

Operational costs of the metro includes the following:

(i) Labor cost

(ii) Head office expense

(iii) Maintenance cost

(iv) Power cost

(v) Cost for off-rail business

The labor costs includes payments to both Japanese and Mongolian staff[3]. It is assumed that after the metro opens in 2021, Japanese staff would continue to work until 2029 in order to transfer their knowhow to Mongolian employees as well as to setup of the operating organization (UBMA) before its operation. The infra-rent fee is 2% of infrastructure which is paid to the government every year.

5) Revenue

The revenue of the UBMC consists of the fare revenue and the off-rail business revenue.

(i) Fare revenue

This study adopts three cases of the average fare: MNT 400 (the same as bus fare), MNT 600 (the same as the amount citizens are willing to pay) and MNT 800. The fare as of the commencement of the operation is calculated based on the inflation rate indicated below under the heading 9) Inflation. The fare is assumed to be raised by 10% every three years.

[3] The cost is calculated based on the table 8.4.1 in 8.4.2 of Chapter 8, considering inflation.

(ii) Off-rail business revenue

Primarily the revenue other than fares is from advertisements. The amount of revenue is assumed to be a fixed rate of the fare revenue (2021－2024: 2%、2025－2030: 4%、2031－2040: 6%).

6) Tax

The following are taxes related to the operation of the UB metro project.

(i) Corporate Income Tax (CIT)

The CIT rate stipulated by the CIT law is classified by the amount of income as follows.

3 billion MNT or over: 25%

Below 3 billion MNT: 10%

(ii)VAT: 10%

7) Subsidy

This study does not consider subsidy from the government such as Viability Gap Funding (VGF) and the minimum revenue guarantee. However, as with the case of bus companies in UB city, the government provides support for student and elderly discounts. This means that 100% of the fare revenue goes to the UBMC.

8) Exchange rate

The following rate as of April 2013 is applied.

USD 1= JPY 94.16 (USD 1=JPY 100 is applied only for the construction cost)

MNT 1=JPY 0.07

USD1=MNT 1,395

EUR1=MNT 1,787.87

9) Inflation rate

With regard to the calculation of the labor cost of Mongolian staff, head office expenses, maintenance cost, power cost, inflation rate is considered. IMF statistical data projection shows an average inflation rate of 9.7% from 2011 to 2017 and the inflation target of the central bank of Mongolia is below 10%. Based on this data, this study adopts a 9.8% inflation rate until 2017. From 2018 to 2023, the growth rate is assumed to be7% and 5% after 2024. The labor cost of Mongolian staff is assumed to increase at 70% of the inflation rate. Table 10.2.1 shows the summary of this assumption.

Table 10.2.1 Assumptions of financial analysis

Assumption		Remarks
Start of the project:	2013	
Opening year:	2021	
Analysis period:	Construction period: from 2013 to 2020 Operational period: from 2021 to 2040 (20 years)	
Investment cost:	The total investment cost is MNT 2.4 trillion and MNT 400 billion (JPY 150 billion), of which respective amounts of MNT 2 trillion and MNT 80 billion (JPY 130 billion) are for infrastructure and MNT 320 billion (JPY 20 billion) is for rolling stock and related facilities invested by UBMC. A breakdown of the MNT 320 billion is shown below. Construction cost: MNT 230 billion (JPY 14 billion), includes	

	maintenance of depots, a part of stations (ticket machines and gates), rolling stock and related facilities, design costs and price escalation. Opening expenses: MNT 90 billion (JPY 6 billion), includes labor cost, training cost and operation cost.	
Useful life	Civil works: 40 years Railway track: 30 years E&M: 15 years Rolling stock: 20 years	
Infra-rent fee:	2% of infrastructure (US$26 million)	
Revenue:	Fare box revenue and off-rail business revenue The following is the rate of off-rail business revenue to fare box revenue: 2021－2024: 2% 2025－2030: 4% 2031－2040: 6% Profit ratio of off-rail business: 40%	
Fare system:	Increase by 10% every three years Discount fare is not included（100% of fare revenue is considered）	Three cases of fare system are proposed.
Users:	Year 2021: 326,219 people Year 2030: 486,975 people Growth rate4.55% until 2030, 1% after 2013	
Average trip length:	Year 2021: 6km Year 2030: 6km	The length is fixed as 6 km.
Tax:	CIT: 10%（below 3 billion MNT）、25%（3 billion MNT or over） VAT:10%	
Exchange rate:	1USD=94.16JPY 1MNT=0.07JPY 1USD=1395MNT 1EUR=1878.78MNT	OANADA rate on April 1st , 2013
Inflation rate:	The following inflation rate is applied to the fare and O&M cost 2011－2017:9.8% 2018－2023:7.0% 2024－2040:5.0% Labor cost of Mongolian staff is assumed to increase at the rate of 70% inflation rate	IMF statistical data

10.2.2 Fare system

Regarding the fare system, the following three cases are set for analysis:

1. P_0: Fare which is the same as the bus fare. Average fare is MNT 400.
2. P_1: Average fare is MNT 600. This fare represents the amount Mongolians are willing to pay as identified in a public transport survey conducted in this study.
3. P_2: Average fare of MNT 800, which is higher than P_1, is to be analyzed as well.

10.2.3 Financing scheme

This study assumes the succeeding cases of the financial scheme for two categories: the total project cost and only the upper portion (rolling stock and related facilities). As for the total project cost, there are three cases among which two cases include a Japanese ODA loan for the infrastructure (Cases 1 and 2 in Table 10.2.2) and the other does not.

Regarding the upper portion, the gearing ratio is 30% in all cases, and the debt is divided into two cases: (1) combination of loans of international financial institutions (IFIs) and loans from a market such as commercial banks, and (2) Private Sector Investment Fund (PSIF) of the Japanese government.

Loan conditions of each case are summarized in Tables 10.2.2 and 10.2.3.

Table 10.2.2 Financing Scheme Cases of the UB Metro Project

		Case 1	Case2	Case 3
Infrastructure (Fundamental structures): US$1,300 million	Fund from Mongolian Government (State Budget and Human Development Fund)	US$400 million	US$400 million	US$400 million
	Bonds with government guarantees (DBM bonds and Samurai Bonds)	US$300 million • Redemption period: 10 years • Interest: rate 7%	US$300 million • Redemption period: 10 years • Interest rate: 7%	US$900 million • Redemption period: 10 years • Interest rate: 7%
	ODA loan from Japanese Government	US$600 million • STEP • Repayment period: 40 years • Interest rate: 0.1% • Grace period: 10 years	US$600 million • Project Loan • Repayment period: 25 years • Interest rate: 1.4% • Grace period: 7 years	-
Rolling stock and related facilities (UBMC): US$200 million	Gearing Ratio	30%	30%	30%
	Debt 1	60% (IFIs) • Repayment period: 12 years • Interest rate: 1%	• 70% (PSIF) • Repayment period: 20 years • Interest rate: 4%	70% (PSIF) • Repayment period: 20 years • Interest rate: 4%
	Debt 2	10% (Commercial Banks) • Repayment period: 10 years • Interest rate: 8%	-	-

Note: STEP stands for **S**pecial **T**erm for **E**conomic **P**artnership

Table 10.2.3 Financing Scheme Cases of UBMC

	Case 1	Case 2
Gearing ratio	30%	30%
Debt 1	60% IFIs Term: 12 years Interest rate: 1%	70% ODA loan Term: 20 years Interest rate: 4%
Debt 2	10% Commercial banks Term: 10 years Interest rate: 8%	-

10.2.4 Cash flow Analysis of the Metro Project

Cash flow analysis was conducted on the assumption that one operator implements Engineering Procurement and Construction (EPC) and all activities regarding the operation of the metro (with US$1.5 billion investment). The following tables summarize the result of each case.

In the case of P_0 (MNT400), which is the same as that of bus fare, almost all of PIRR and Equity IRR are negative values in every case. Besides, the payback period is over 20 years, and this shows that this project has no value worth investing in for an operator and investors. Even in the case of P_1 and P_2, PIRR of cases 1and 2 with an ODA loan shows 2% and 3.5%, respectively. In addition, Equity IRR of case 1 is 10.4% and that of case 2 is 5.8% and the payback period is too long–between 14 and 17 years. Therefore, it can be concluded that even if the fare is the same amount as that of willingness to pay or higher, this project is not profitable. Furthermore, in the case of a financing scheme without an ODA loan (case 3), even if the fare is MNT 800, PIRR is 2.9% and Equity IRR is 1.9%, which are lower than the other two cases with an ODA loan.

Based on this result, it is important to examine the implementation scheme on the basis of the two-tiered system discussed in Chapters 8 and 9 in order to implement this Metro Project in a sustainable way. A preferable scheme is for UBMC to only invest in rolling stock and a part of E&M and pay an infra-rent fee to the government which owns the infrastructure to use it. The next subsection conducts analysis of the case.

Table 10.2.4 Case 1 of the Metro Project（with ODA, STEP）

	P_0	P_1	P_2
PIRR	-0.8%	2.1%	3.7%
Equity IRR	1.7%	10.4%	15.8%
Profit earning year	2028	2025	2024
Payback period (Year of turning accumulated cash flow to positive)	Over 20 years (N/A)	16.42 years (2037)	14.17 years (2035)
Gross sales in 2030 （million MNT）	172,290	233,344	276,182
Gross sales in 2040 （million MNT）	284,578	385,160	457,765
Profit before tax in 2030	28,812	73,474	104,232
Profit before tax in 2040	111,364	184,066	235,202
DSCR	2.31	3.42	4.20

Source: JICA Study Team

Table 10.2.5 Case 2 of the Metro Project（with ODA, General）

	P_0	P_1	P_2
PIRR	-1.0%	2.0%	3.5%
Equity IRR	-1.9%	5.8%	11.0%
Profit earning year	2028	2026	2025
Payback period (Year of turning accumulated cash flow to positive)	Over 20 years (N/A)	16.61years (2037)	14.33 years (2035)
Gross sales in 2030 （million MNT）	172,290	233,344	276,182
Gross sales in 2040 （million MNT）	284,578	385,160	457,765
Profit before tax in 2030	28,639	73,300	102,229
Profit before tax in 2040	111,364	184,006	235,202
DSCR	1.49	2.21	2.71

Source: JICA Study Team

Table 10.2.6 Case 3 of the Metro Project（without ODA）

	P_0	P_1	P_2
PIRR	-1.5%	1.4%	2.9%
Equity IRR	-7.4%	-1.7%	1.9%
Profit earning year	2029	2028	2027
Payback period (Year of turning accumulated cash flow to positive)	Over 20 years （N/A）	17.52 years （2038）	15.16 years （2036）
Gross sales in 2030 （million MNT）	172,290	233,344	276,182
Gross sales in 2040 （million MNT）	284,578	385,160	457,765
Profit before tax in 2030	19,132	63,794	94,552
Profit before tax in 2040	111,364	184,066	235,202
DSCR	4.73	6.96	8.52

Source: JICA Study Team

10.2.5 Cash flow Analysis of the UBMC

The result of financial analysis of the UBMC (with the investment cost of MNT 320 million) by the financing scheme of Table 10.2.3 is shown in the succeeding tables.

In all cases, when the fare is P_1 or over, PIRR is over 18% and it is in the black from the first year of operation. From the viewpoint of equity, Equity IRR is over 19% and the payback period is also short (less than six years). In particular, in the case of P_2, PIRR is over 20%. However, in the case of P_0, PIRR and Equity IRR are about 11% and it will take five years to turn cash flow to positive; and the payback period is over 10 years.

Consequently, when the average fare of MNT 600 is chosen among the three cases, the UBMC operation will be financially feasible, and it is profitable from the aspect of the investment in equity.

Table 10.2.7 Case 1（Gearing ratio: 30%, IFIs: 60%, Commercial banks: 10%）

	P_0	P_1	P_2
PIRR	11.1%	18.5%	22.5%
Equity IRR	10.8%	19.7%	24.0%
Profit earning year	2025	2021	2021
Payback period (Year of turning accumulated cash flow to positive)	9.60 (2029)	5.83 (2026)	4.58 (2025)
Gross sales in 2030 （million MNT）	172,290	233,344	276,182
Gross sales in 2040 （million MNT）	284,578	385,160	457,765
Profit before tax in 2030	41,176	85,838	116,597
Profit before tax in 2040	105,614	178,317	229,452
DSCR	1.61	3.13	4.15

Source: JICA Study Team

Table 10.2.8 Case 2 (Gearing ratio: 30%, PSIF: 70%)

	P_0	P_1	P_2
PIRR	11.2%	18.7%	22.6%
Equity IRR	11.0%	19.7%	23.9%
Profit earning year	2025	2021	2021
Payback period (Year of turning accumulated cash flow to positive)	9.60 years (2030)	5.7 years (2026)	4.51 years (2025)
Gross sales in 2030 (million MNT)	172,290	233,344	276,182
Gross sales in 2040 (million MNT)	284,578	385,160	457,765
Profit before tax in 2030	39,288	83,949	114,708
Profit before tax in 2040	104,370	177,073	228,208
DSCR	2.23	4.37	5.80

Source: JICA Study Team

10.2.6 Sensitivity Analysis (Case 2 of UBMC)

(1) Analysis of cost/expense and revenue

Regarding Case 2, Tables 10.2.9 and 10.2.10 show the variation of PIRR by fare system (P_0 and P_1) when the cost/expense and the revenue vary between -10% and +10%. Considering the current market rate, it is fair to say that PIRR over 15% shows that the project is feasible. As for P_0, PIRR is higher than 15% in the case of the best combination (+10% of revenue and -10% of cost). In the case of P_1, PIRR is over 15% in all cases but the worst condition (-10% of revenue and +10% of cost) and the second worst condition (-10% of revenue and +5% of cost). Consequently, with the variation within 10%, P_0 makes the metro project feasible in most cases (PIRR over 15% is highlighted in the following tables).

Table 10.2.9 Variation of PIRR in the case of P_0 (Average fare: MNT 400)

Investment cost/ expense / Revenue	−10%	−5%	0%	+5%	+10%
+10%	16.1%	14.8%	13.6%	12.5%	11.4%
+5%	14.9%	13.7%	12.5%	11.3%	10.2%
0%	13.7%	12.4%	11.2%	10.0%	8.9%
−5%	12.4%	11.1%	9.9%	8.7%	7.5%
−10%	11.0%	9.7%	8.4%	7.2%	6.0%

Table 10.2.10 Variation of PIRR in the case of P_1 (Average fare: MNT 600)

Investment cost/ expense / Revenue	−10%	−5%	0%	+5%	+10%
+10%	23.5%	22.2%	21.0%	19.9%	18.8%
+5%	22.3%	21.1%	19.9%	18.7%	17.6%
0%	21.1%	19.8%	18.7%	17.5%	16.4%
−5%	19.8%	18.6%	17.4%	16.2%	15.2%
−10%	18.5%	17.2%	16.0%	14.9%	13.8%

(2) Analysis of infra-rent fee

As for the analyses above, the infra-rent fee is assumed to be 2% of the initial cost (about US$26 million per year). The following table shows the variation of indicators by fare system

when the rate of infra-rent fee increases to 3%. When the average fare is P_1 or over (higher than MNT 600), PIRR is over 16.9%, and this means the UBMC operation is financially feasible. An infra-rent fee of 2% means that the investment of the infrastructure will be paid back for 50 years and 3% will be paid back for about 33 years.

Table 10.2.11 Indicators of Case 2（Infra-rent of 3%）

	P_0	P_1	P_2
FIRR	7.7%	15.9%	20.2%
Equity IRR	6.4%	16.6%	21.3%
Profit earning year	2026	2022	2021
Payback period (Year of turning accumulated cash flow to positive)	12.25 years (2033)	7.13 years (2028)	5.37 years (2026)
Gross sales in 2030 （million MNT）	172,290	233,344	276,182
Gross sales in 2040 （million MNT）	284,578	385,160	457,765
Profit before tax in 2030	24,829	69,490	100,249
Profit before tax in 2040	89,911	162,614	213,749
DSCR	1.33	3.55	5.0

10.2.7 Conclusion

On the assumption that one operator implements the UB Metro Project, profitability in three cases are examined. Two cases are with an ODA loan (STEP and general loan) and the third is without ODA. In cases 1 and 2, with ODA, PIRR is 2% for P_1 (MNT 600) and 3.5% for P_2 (MNT 800), respectively. In addition, Equity IRR is 10.4% in case 1 and 5.8% in case 2 and the payback period is very long, from 14 to 17 years. Consequently, even if the average fare is the same amount as that citizens are willing to pay (MNT 600) or over, this project will not be profitable.

On the other hand, the result of analysis of UBMC's investment cost is US$200 million based on the two-tiered system. On the assumption that the infra-rent fee is 2% (US$26 million) of the infrastructure cost, PIRR in the case of an average fare of MNT 400 is around 10~11% in all financing cases, which shows this fare system does not make the metro operation feasible. On the other hand, in the case of MNT 800, PIRR is greater than 22% and profitability is high. However, the fare is higher than UB city citizens are willing to pay (MNT 500~MNT 600) and it may possibly reduce the demand. Then, in the case of MNT 600, which is almost the same as the willingness to pay, PIRR is around 18.5% and Equity IRR is around 19.7%. In conclusion, MNT 600 secures profitability sufficient to make the metro business viable.

Alternatively, the result of the sensitivity analysis of Case 2 shows that with an average fare of MNT 600, PIRR is over 15%, which is high enough if the revenue and the cost vary between +10% and -10%, except the worst condition that the revenue decreases by 10 % and the cost increases by 10% and the second worst condition that revenue decreases by 10 % and the cost increases by 5%. In addition, when the infra-rent fee is 3% (US$39 million), PIRR of P_1 is 15.9%, which also shows the metro project is feasible.

Tables 10.2.12 and 10.2.13 show an income statement and cash flow statement of case 1 (average fare: MNT600) for the UB Metro Project and case 2 (average fare: MNT 600) for the UBMC respectively.

Table 10.2.12 Income and Cash Flow Statements (UB Metro Project)

Case1 (with ODA, STEP)
Average fare: MNT 600

(MNT, million)

PROFIT AND LOSS STATEMENT	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1). Revenue	0	115,547	132,888	138,937	145,262	169,800	177,530	185,611	213,467	223,184	233,344	263,542	266,294	269,076	299,075	302,198	305,355	339,399	342,944	346,526	385,160
a. Operating Revenue	0	113,653	130,709	136,659	142,880	164,323	171,803	179,624	206,581	215,984	225,816	250,991	253,612	256,259	284,828	287,802	290,807	323,227	326,602	330,012	366,804
b. Other Revenue	0	1,894	2,178	2,278	2,381	5,477	5,727	5,987	6,886	7,199	7,527	12,551	12,683	12,816	14,246	14,396	14,548	16,171	16,341	16,514	18,356
2). Operation & Maintenance Costs	0	85,892	86,312	88,061	86,202	86,215	82,067	77,676	72,333	67,144	64,660	66,923	69,723	72,680	76,551	79,797	83,193	87,628	91,355	95,255	100,337
a. Staff costs	0	18,957	18,234	18,750	17,690	15,937	16,339	16,756	17,188	17,634	14,213	14,711	15,225	15,758	16,310	16,881	17,471	18,083	18,716	19,371	20,049
b. Power costs	0	4,714	5,044	5,397	5,457	5,730	6,017	6,318	6,633	6,965	8,222	8,633	9,065	9,518	9,994	10,494	11,018	11,569	12,148	12,755	13,393
c. HQ costs		4,286	4,586	4,907	4,961	5,209	5,470	5,743	6,030	6,332	6,649	6,981	7,330	7,697	8,081	8,485	8,910	9,355	9,823	10,314	10,830
d. Maintenance Costs	0	16,171	17,303	18,515	18,720	19,656	20,639	21,671	22,755	23,893	27,658	29,041	30,493	32,018	33,618	35,299	37,064	38,918	40,863	42,907	45,052
e. Cost of non-fare business	0	1,137	1,307	1,367	1,429	3,286	3,436	3,592	4,132	4,320	4,516	7,530	7,610	7,690	8,548	8,638	8,729	9,703	9,805	9,908	11,014
f. Cost for Infra rent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
f. Interest Costs		40,627	39,837	39,126	37,944	36,396	30,166	23,595	15,595	8,001	3,402	27	0	0	0	0	0	0	0	0	0
g. Other Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3). Depreciation	0	83,439	83,439	83,439	83,439	83,439	67,929	67,929	67,929	67,929	70,719	70,719	70,719	70,719	70,719	70,719	42,191	42,191	39,401	39,401	39,401
a. Civil Work UG		21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624	21,624
b. Civil Work EL		10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220	10,220
c. Opening Expenses	0	15,510	15,510	15,510	15,510	15,510	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. E&M	0	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	0	0	0	0	0
e.E&M and Railroad track (infra)		28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	28,505	3,023	3,023	3,023	3,023	3,023
f. Rolling Stock	0	628	628	628	628	628	628	628	628	628	628	628	628	628	628	628	0	0	0	0	0
g. others (design, land etc.)		4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534	4,534
g. Addition/Renewal (Rolling Stock/E&M)											2,790	2,790	2,790	2,790	2,790	2,790	2,790	2,790	0	0	0
4). Net Income before Tax	0	-53,783	-36,863	-32,563	-24,379	146	27,534	40,006	73,204	88,111	97,965	125,900	125,853	125,677	151,804	151,683	179,971	209,580	212,188	211,870	245,422
5). Income Tax	0	0	0	0	0	15	6,883	10,002	18,301	22,028	24,491	31,475	31,463	31,419	37,951	37,921	44,993	52,395	53,047	52,967	61,355
6). Net Income after Tax	0	-53,783	-36,863	-32,563	-24,379	132	20,650	30,005	54,903	66,083	73,474	94,425	94,390	94,257	113,853	113,762	134,978	157,185	159,141	158,902	184,066
Cash flow for FIRR*	-2,528,632	70,282	86,413	48,152	97,003	119,981	125,629	131,530	156,729	164,040	172,086	196,646	196,572	196,395	222,523	222,401	218,535	248,144	246,148	247,644	283,009
Cash flow for Equity IRR*	-97,300	-15,264	-4,733	-51,604	-8,258	-52,395	-55,468	-68,175	-27,511	11,053	36,913	107,823	105,555	121,646	141,258	138,792	127,864	150,093	144,753	146,345	173,351

*The amount of cash flow of PIRR and Equity IRR in 2020 is the total amount from 2013 to 2020, respectively.
Source: JICA Study Team

Table 10.2.13 Income and Cash Flow Statements (UBMC)

Case 2（Gearing Ratio: 30%、PSIF: 70%）
Average fare: MNT 600

(MNT, million)

PROFIT AND LOSS STATEMENT	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1). Revenue	0	115,547	132,888	138,937	145,262	169,800	177,530	185,611	213,467	223,184	233,344	263,542	266,294	269,076	299,075	302,198	305,355	339,399	342,944	346,526	385,160
a. Operating Revenue	0	113,653	130,709	136,659	142,880	164,323	171,803	179,624	206,581	215,984	225,816	250,991	253,612	256,259	284,828	287,802	290,807	323,227	326,602	330,012	366,804
b. Other Revenue	0	1,894	2,178	2,278	2,381	5,477	5,727	5,987	6,886	7,199	7,527	12,551	12,683	12,816	14,246	14,396	14,548	16,171	16,341	16,514	18,356
2). Operation & Maintenance Costs	0	83,823	85,033	87,493	86,816	88,377	90,459	94,242	101,506	106,455	107,694	112,503	114,546	116,766	119,947	122,547	125,344	129,226	132,447	135,886	140,554
a. Staff costs	0	18,957	18,234	18,750	17,690	15,937	16,339	16,756	17,188	17,634	14,213	14,711	15,225	15,758	16,310	16,881	17,471	18,083	18,716	19,371	20,049
b. Power costs	0	4,714	5,044	5,397	5,457	5,730	6,017	6,318	6,633	6,965	8,222	8,633	9,065	9,518	9,994	10,494	11,018	11,569	12,148	12,755	13,393
c. HQ costs		4,286	4,586	4,907	4,961	5,209	5,470	5,743	6,030	6,332	6,649	6,981	7,330	7,697	8,081	8,485	8,910	9,355	9,823	10,314	10,830
d. Maintenance Costs	0	16,171	17,303	18,515	18,720	19,656	20,639	21,671	22,755	23,893	27,658	29,041	30,493	32,018	33,618	35,299	37,064	38,918	40,863	42,907	45,052
e. Cost of non-fare business	0	1,137	1,307	1,367	1,429	3,286	3,436	3,592	4,132	4,320	4,516	7,530	7,610	7,690	8,548	8,638	8,729	9,703	9,805	9,908	11,014
f. Cost for Infra rent	0	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558	38,558
g. Interest Costs		0	0	0	0	0	0	1,603	6,211	8,753	7,878	7,049	6,266	5,528	4,837	4,192	3,593	3,041	2,534	2,073	1,659
h. Other Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3). Depreciation	0	26,438	26,438	26,438	26,438	26,438	10,928	10,928	10,928	10,928	13,717	13,718	13,718	13,718	13,718	13,718	11,300	11,300	8,510	8,510	8,510
a. Civil Work UG																					
b. Civil Work EL																					
c. Opening Expenses	0	15,510	15,510	15,510	15,510	15,510	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. E&M	0	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	0	0	0	0	0
e. Depot(included in E&M)																					
f. Rolling Stock	0	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510	8,510
g. Addition/Renewal (Rolling Stock/E&M)											2,790	2,790	2,790	2,790	2,790	2,790	2,790	2,790	0	0	0
4). Net Income before Tax	0	5,287	21,418	25,007	32,008	54,986	76,143	80,442	101,033	105,802	111,933	137,322	138,031	138,592	165,410	165,934	168,711	198,873	201,988	202,131	236,097
5). Income Tax	0	1,322	5,354	6,252	8,002	13,746	19,036	20,110	25,258	26,450	27,983	34,330	34,508	34,648	41,353	41,483	42,178	49,718	50,497	50,533	59,024
6). Net Income after Tax	0	3,965	16,063	18,755	24,006	41,239	57,107	60,331	75,775	79,351	83,949	102,991	103,523	103,944	124,058	124,450	126,533	149,155	151,491	151,598	177,073
Cashflow for FIRR*	-329,075	40,478	55,733	16,643	64,711	86,952	91,908	95,562	115,554	119,770	128,184	153,113	153,407	153,599	180,095	180,342	176,845	206,822	205,195	207,059	242,793
Cashflow for Equity IRR*	-98,722	10,131	20,221	-19,575	27,984	45,318	44,278	49,237	69,349	73,731	80,086	98,028	95,958	96,017	115,779	113,427	109,108	131,383	126,055	127,623	166,090

*The amount of cash flow of PIRR and Equity IRR in 2020 is the total amount from 2013 to 2020. respectively.
Source: JICA Study Team

10.3 Establishment of Operation and Effect Indicators

In order to evaluate how the study contributes to the various expected benefits in its ex-ante and ex-post stages, operation and effect indicators are set. Operation indicators measure quantitatively the operational status of a project, while effect indicators measure qualitatively the effects generated by the study. In case of the railway business, operation indicators includes the number of passengers and passenger kilometers etc. and effect indicators are time cost saving, traffic smoothness, environmental mitigation and so on. Table 10.3.1 shows examples of such indicators.

Table 10.3.1 Examples of Operation and Effect Indicators in UMRT Project

	Operation Indicator	Effect Indicator
Number of passengers	○	
Passenger kilometers	○	
Operator's Revenue (fare box revenue)	○	
Revenue from off-rail business	○	
Time cost saving		○
Traffic, comfort, smoothness (incl. timeliness)		○
Environmental mitigation (air pollution, global warming gas)		○
Regional economy		○

In the case of the UB Metro, the following operation and effect indicators are set, taking into account the collection of baseline and post-project implementation data (Table 10.3.2 and table 10.3.3).

Table 10.3.2 Operational Indicators of UB Metro

Evaluation criteria	Operational indicators
Number of passengers	Increase in the number of passengers
Passenger kilometers	Prolonged in passenger kilometers
Number of times the train is operated	Increase in the number of trains operated
Operator's revenue	Increase in fare revenue Increase in profit before tax
Revenue from off-rail business	Increase in advertising revenue Increase in the number of stores in stations Growth of the rate of revenue from the off-rail business in the total revenue

Table 10.3.3 Effect Indicators of UB Metro

Evaluation criteria	Effect indicators
Time cost saving	Commuting time is shortened.
Traffic, comfort, smoothness (incl. timeliness)	Timeliness is increased. Number of changes of the public transports is reduced.
Convenience of daily life	Public services and commercial facilities along the railway line are developed.
Environmental mitigation (air pollution, global warming gas)	Emission of CO2 is reduced. Emission of NO_X is reduced.
Safety	Number of traffic accidents is reduced.
Revitalization of regional economy	Number of investors along the railway line is increased.
Revitalization of real estate market	Demand of floor space is increased.
Job creation	Number of employees is increased. Unemployment rate is reduced.

11 Recommendations

11 Recommendations

11.1 Summary of Major Findings

The summary of this study's results is as follows.

(1) Issues of Transportation of Ulaanbaatar City

- Motorized vehicles are the only current means of urban transportation in Ulaanbaatar. The road traffic capacity is not fully utilized due to the improper use of road spaces, including on-street car parking, and the inefficient traffic management.
- Even though these issues are solved, the transport demand by 2030 is projected to be 3.1 times that in 2010. The existing road capacity would not be able to meet the demand of automobile traffic in the near future.
- Therefore, it is essential to introduce a mass transit system to meet the constantly increasing traffic demands in the future.

(2) Planning Outline of Ulaanbaatar Metro

- The Ulaanbaatar Metro (UB Metro) is proposed as a kind of public transport system commensurate with the future Ulaanbaatar City. The metro line is 17.7 km long along Peace Avenue connecting the east and the west of the urbanized city area. The UB Metro is structured with underground and elevated railway sections.
- The UB Metro adopts a grade separation system in order to completely divide railway and road traffic. The underground structure is 6.6 km long through the central part of the city between the west and the east intersections. The other lines, on both sides of the city center, are the elevated structures.
- The UB Metro is an urban railway system which has a double track along the whole line and adopts a fully electrified mass rapid transit system to satisfy the future demand.
- The initial investment cost is expected to reach a total of US$1.5 billion. Out of that, approximately US$1.3 billion is for the construction of the infrastructure including the underground and elevated structures, stations, and respective facilities, while approximately US$0.2 billion needs to procure rolling stock (RS), its related E&M (equipment and machine), and its startup capital.

(3) Integrated Urban Development with the Ulaanbaatar Metro

- In parallel with the UB Metro development, the following urban developments are necessary to be implemented:
  - Development of intermodal transfer facilities and a feeder bus service system around station areas;
  - Creation of sub-centers with the intensive utilization of land, construction of tall buildings and a highly dense population in station areas of the city center and major intermodal transfer districts; and
  - Promotion of a housing policy to control the urban sprawl and to facilitate reconstruction of old apartments along the metro line to promote relocation of residents from Ger areas.

(4) Impacts of the Development

- Economic impacts are expected from the UB Metro development in terms of the

following:

- The travel time saving of the residents reduces time loss and revitalizes economic activities. (For example, travel time is lessen from 45 minutes by bus to 15 minutes by the Metro);
- Reduction of traffic congestion, especially in the central part of the city. (The traffic volume decreases by 16% and the average speed increases by 25%);
- Improvement of the residents' living condition and the vitalization of business and commercial activities in the Central Business District (CBD) through the increase of the number of employees and shoppers by the improvement of access to the city center;
- Improvement of safety and the reduction of social costs by reducing the number of car accidents; and
- Upgrading of the environmental conditions by reducing CO_2 emission.

- The total economic benefits mentioned above are much higher than the total cost of the metro development. The Economic Internal Rate of Return (EIRR) of the total project cost of US$1.5 billion is 15%-20%; and therefore, the economic rationality is good enough.

(5) Securing Financial Sources Required for the Construction

- The following tax revenues of the state and the Ulaanbaatar city governments will be increased by the UB Metro development:
  - Sales tax and income tax
  - Real estate-related tax
  - New taxes on urban development-related activities
- The infrastructure is expected to be developed as public works to be executed by the government sector, with support of ODA budget. The state budget and the Development Bank of Mongolia's (DBM's) bonds, as well as Japanese Yen loan, will be utilized.
- Introduction of a governmental subsidy system, in which a part of the increased tax revenue is utilized for the construction cost, is recommended. The Tax Increment Financing (TIF) deserves to be developed in this regard.

(6) Possibility of Sustainable Business Management

- If an entity is supposed to be responsible for the metro project with all the investments of US$1.5 billion, the cash flow situation of the entity will be too difficult to manage the project. Given the average fare of MNT 600/passenger, the Project Financial Internal Rate of Return (PIRR) is computed at a low as 2.0% p.a. This means that the commercial operation of the project will be practically impossible.
- Therefore, a two-tiered system is recommended to make the metro project financially feasible, that is, as the infrastructure owner and as the service provider. As the service provider, or the operation management body, the **Ulaanbaatar Metro Corporation** (UBMC) shall be established as a public company, inviting both the public and the private sectors' participation in terms of the equity or the management. The private sector is so-called "Strategic Partners" that have technologies, knowledge and experiences in operation and management of the metro as well as capital.
- The UBMC shall invest a total of US$200 million for procurement of rolling stock and

related E&M, and the operation cost and renewal costs of rolling stock and E&M shall be covered by the fare revenue. Moreover, the UBMC shall have a responsibility of paying a certain amount of the concession fee (or the infra-rent) to the infrastructure owner (or the state government) out of the fare revenue.

- A cash flow analysis of the UBMC was conducted based on the following two fare systems:
  - P_0 Case: Average fare of MNT 400
  - P_1 Case: Average fare of MNT 600
- Under an assumption that the annual infra-rent is equivalent to 2% of the initial infrastructure cost (or US$26 million), the following results are revealed:
  - P_0 Case: PIRR is computed at 11.2%, and it drops to 6.0%, given a 10% increase of the cost cum a 10% decrease of the revenue. Thus, the elasticity for risks is low, which concludes that the metro project is not feasible enough.
  - P_1 Case: PIRR is 18.7%, which shows that the project is viable. Furthermore, the PIRR can still stay at 13.8%, which is high enough, even if the cost and the revenue changed with +10% and -10%, respectively.
- The P_1 Case shows anther result that even though the infra-rent fee is raised to 3% (US$39 million/year), the PIRR is 15.9 %, which means that the metro business will still be viable.

(7) Issues to be Considered in the Project Implementation

- The UB Metro must be planned in accordance with the Railway Law.
- Establishment of the "Ulaanbaatar Metro Corporation (UBMC)" is recommended as the implementing and operating body of the metro project. The UBMC is structured collaboratively with the national and city governments and the private entities in line with the Mongolian systems and actual circumstances.
- A support team by Japanese private companies will make equity participation as strategic partners to be able to support and provide their know-how in the construction and operation of the urban railway system.
- Multiple financial sources, such as Mongolian state budget, ODA including Japanese Yen loan, and private financial resources, must be secured.
- A rational public transport policy with a sustainable fare system, including social support to students, elderly people, low income people, etc., needs to be established in order to enable the metro operation to be sustainable and reliable.

11.2 Competitiveness for Japanese Private Companies

11.2.1 International Competitiveness for Introduction of the Metro System

Needless to say, technical skills of Japanese companies are high and they have a competitive advantage internationally as to the introduction of the urban railway system in developing countries. However, it is not the same situation for the procurement of the system. In fact, the Japanese manufactured products are expensive, thereby losing its price competitiveness at the Asian market. Even if Japanese producers appeal that the whole life cycle cost of Japanese products will not be expensive in the long run, compared to other countries' products, it is challenging and quite difficult to convince people of the logic behind the comparison of the actual life cycle cost with that of the same kind of products from other countries. Moreover, there are few cases that bidding conditions include the component of life cycle cost.

There is an opinion that Japan is able to utilize its comprehensive competitiveness in a package-bidding system. However, the railway system contains a large number of procurement items, so if each manufacturer focuses on its own profit, there is a risk that the elasticity (flexibility) of the price as a package is lost, thereby resulting in losing the international competitive power in the price negotiation. Thus, it is necessary to seek the possibility to make a package of software and hardware components to maintain their original competitiveness.

From the above point of view, Japanese companies can contribute to the realization of this project in the following three sectors with substantial international competitiveness.

(1) Provision of Passenger Transportation Service with Safety and Security

The know-how of the urban railway service operation in Japan is known in the world in terms of its safety and punctuality. Certainly, Japan has a high competitiveness in organizational and system developments and a human resource development program to enable the railway services to keep the safety and punctuality.

(2) Advanced Construction Technologies for the Underground Structure by Shield Tunneling Method and under Cold Climate Condition

For the construction of the underground structures, a shield tunneling method is the most suitable in the case of this project. Japan has the technical superiority internationally in this method. Especially that this project needs to appropriately deal with some serious technical issues such as the underground water, thus, Japanese companies have advantages since they are very trusted in this kind of technology.

Construction techniques under cold regions which are used in Hokkaido, Japan can be suitable and effective. Technical transfer of the construction management skills for the cold winter is also expected.

(3) Rolling Stock System Advantageous for Maintenance

Procurement of rolling stock and a signal system is the most competitive sector in the railway system all over the world. The well-known manufacturers in Japan are Mitsubishi Heavy Industries, Ltd., Kawasaki Heavy Industries, Ltd., Japan Transport Engineering Company and so on. Bombardier, Alstom, and Siemens from Europe and Canada are called the BIG 3. General Electric in the US and Hyundai Rotem in Korea are also famous and really competitive.

For the Japanese manufacturers to win the competition under such a market situation, the strategy must be carefully prepared. It is required to secure advantages with the differentiation to provide a package service with software components. The additional services in the package include, for example, the rapid recovery from failures, advantages (e.g. low-cost) of maintenance, and a long-term training program for mechanics, etc. Cooperation with the financial support for the procurement also increases Japan's competitiveness. Hence, a comprehensive support package with three elements of "hardware," "software," and "human-ware" plus another element of "finance" should be provided for keeping Japanese competitiveness.

11.2.2 Competitiveness by Integrated Financial Support

As discussed in the previous chapters, this project is composed of infrastructure and transport systems including rolling stock. These two components differ in character and structure of business and procurement. As for the infrastructure, a Japanese yen loan is used as an ODA project; in particular, if a special term economic partnership (STEP) loan is provided for the construction of a tunnel (underground portion), the technical advantage of Japanese companies is possible to be utilized.

On the other hand, the transport system comprises mainly the procurement of rolling stock and related equipment, and hence Japanese manufacturers are able to take advantage if the financial assistance is provided by the Japan Bank for International Cooperation (JBIC) as a development and import financial project.

If this metro project is implemented under the Concession Law, the procurement has to follow the rules and regulations of an international tender. For Japan to win the international tender against China, Korea and other European countries, the above strategic partnership between the public and the private sectors of Japan is required.

11.2.3 Comprehensive Project Management as a Strategic Partner

Regarding the implementation of the urban transportation system such as metro projects, a turnkey method is common in oil producing countries and developing countries. The turnkey method is a completed order as one package which contains the planning, the construction, the procurement of systems including rolling stock, and the human resource development on operation and management. The major reason to apply this method is that it takes too much time and effort to complete the project if many biddings are separately conducted for various and multiple procurements, from the hardware to the software.

This implies that in order to implement this metro project successfully, the implementing body must have an advanced and comprehensive project management skills. In this regard, the Japanese companies involved in this study have achieved good results in Mongolia through the implementation of various ODA projects, and their capabilities are reliable, which ensures the international superiority.

Based on such a credibility on professional services, the Japanese team, consisting of consultants and private companies, will create a structure with the comprehensive project management skills integrated with such tasks as financing, engineering, development of organizational systems, and human resources development. Then, they will consider how to make an equity participation in the UBMC as a strategic partner. As a result of establishing a strong position in the UBMC, the Japanese team enables the Ulaanbaatar Metro to take a lead in a rational and fair international competitions.

11.3 Recommendations for the Project Implementation

11.3.1 Formulation of Political Will and Policy-Making

To implement the metro project, first of all, a strong will of political leaders is indispensable because it needs a large amount of investment. The total project cost of US$1.5 billion is equivalent to 43% of the annual national state budget in 2011. It cannot be denied that the project cost is remarkably large considering the current economic and financial strength of Mongolia's economy, even though a rapid economic growth is expected in the near future due to a favorable performance in the mining sector.

On the one hand, while citizens in Ulaanbaatar City have been observing various unsolved urban issues, such as the slow infrastructure development, the absence of urban planning administration to deal with the ger area expansion, and serious traffic congestions, some people show their expectations from the metro as a symbol of modernization. Yet, at the same time, others express their concerns for the Mongolian society, i.e., if it has enough capacity to maintain the metro. The metro is an unimagined project for the Mongolian people, and therefore, the decision making as to whether they will agree or disagree is a political issue today and a major concern, as reported by mass media.

Under such circumstances, in order to develop the environment towards the realization of the metro project, the following actions need to be taken by the Mongolian side to establish the political and administrative structures.

(1) Inclusion in the Priority List under the Concession Law

Towards Spring 2013, the Ministry of Economic Development (MED) is reviewing the priority list of PPP infrastructure projects to be implemented under the Concession Law. This metro project is also required to be on the list, especially as a high priority project. In the process, it is necessary that relevant authorities, the Ulaanbaatar City Government in particular, jointly make official efforts for inclusion of the metro project in the priority list of the MED.

(2) Official Approval as a Priority National Project by the Cabinet and the Parliament

The Joint Coordination Committee (JCC) for this project clearly recognized that the owner of the UB Metro is the Ulaanbaatar City Government, and that the first official approval shall be made at the City Council. Based on this resolution, the UB Metro Project was discussed and officially approved by the City Council on 28th March, 2013 (Resolution #8/33). Based on this resolution, the next procedure is to request the Cabinet's official approval.

Considering that UB Metro Project will be implemented with ODA loans, it must be an important process that this project be discussed and go through the Parliament.

11.3.2 Establishment of an Administrative Implementation Mechanism

The establishment of an administrative system to facilitate the project is necessary for the further technical study and different administrative formalities. The body needs to be established in cooperation with the Ministry of Roads and Transportation and the Ulaanbaatar City Government. The following two-tiered mechanism is proposed (see Figure 11.3.1):

(1) **Joint Coordination Committee (JCC)** to facilitate decision-making process; and

(2) **Working Group** to make appropriate judgments, manage required administrative formalities, and to scrutinize technical issues.

JCC has already been organized and functioned in this study. This system is strongly required to keep functioning towards the realization of the metro project after this study is completed.

As for Working Group, on 11th April, 2013, the City Mayor already issued the order to formulate the working group, chaired by the Vice Mayor (in charge of "Infrastructure Development") with relevant department directors such as: Director of Strategic Policy and Planning (Secretariat of the Working Group), Director of Roads, Director of Transportation, and Leader of the JICA Study

Team. The order mentions that the major task of the Working Group is to introduce the JICA Study to the Cabinet members and the Parliament and prepare the official procedures necessary for their approvals.

As a step towards the realization of such a dream project as the UB Metro is being taken, another steadier step should be made with full efforts of the Ulaanbaatar City Government in particular, because the city is the project owner.

Table 11.3.1 Organizational Structure of Mongolian Side to Promote the Project

Organization	Member	Task
Joint Coordination Committee (JCC)	**Chairperson:** State Secretary of Roads and Transportation **Co-chairperson**: Vice Mayor of Ulaanbaatar City **Members:** Ministry of Economic Development; Ministry of Finance; Ministry of Road and Transportation; Ministry of Construction and Urban Development; Ministry of Natural Environment and Green Development; and Ulaanbaatar City Government	• To make administrative decisions to carry out the Project • To prepare for registration on the concession priority project list • To allocate the national and the city government budgets • To arrange the improvement of the legal framework • To make a decision about request for international assistance such as ODA
Working Group	**Chairperson**: Vice Mayor of Ulaanbaatar city **Secretariat:** Director of Strategic Policy and Planning Department, UB City **Members:** Director of Road Department, UB City Director of Transportation, UB City Leader of JICA Study Team	• To function as a secretariat of JCC • To prepare official approvals of the State Cabinet and the Parliament • To prepare for the establishment of Ulaanbaatar Metro Corporation • To prepare the next actions, including D/D and its budgeting • To examine necessary international aids • To discuss technical matters and make selections

Source: JICA Study Team

11.3.3 Information Sharing with Mongolian and Japanese Private Investors and Business Community

Direct and indirect participation of private investors are necessary for the metro project. There are three possibilities for their participation. These are as follows:

(1) To become strategic partners to bring fund and technology to UBMC;

(2) To be contractors for the construction and procurement of equipment and facilities; and

(3) To be developers of station areas to promote the use of the metro and increase the new urban development.

In any form, the participation of both domestic and international investors and private operators is indispensable. Besides, Japan and many other countries such as China, Korea, and European countries are highly interested in participating as international investors. Some international entrepreneurs, being involved in the mining sector, pay attention to the metro project as the next investment opportunity.

Investors and private companies in Japan usually take much time to carefully make a decision on their participation in a project. Therefore, it is necessary to provide detailed information to the Japanese companies to encourage them. At the same time, as the official support of the government increases credibility of the investment in the project, JICA's support and the

Japanese government's continuous concerns over the Metro Project is also significant.

11.3.4 Information Sharing with Other Aid Donors

As shown in Chapter 4, the estimated project cost is about US$1.3 billion for the infrastructure portion, which corresponds to the "fundamental structures" stipulated in the Railway Law. Even if about US$600 million of a Japanese Yen loan is provided for the tunnel section, the remaining US$700 million should be assured to be prepared by the Mongolian government. Thus, it is necessary to seek possible co-financing involving international donors, in addition to Japan, to take part in the project in order to reduce the burden of the Mongolian government.

Technical information should be shared with such international organizations as the Asian Development Bank (ADB), which provide proactive support for the urban transportation system development, and the World Bank, which has a strong interest in the urban environmental improvement.

Regarding the cooperation with ADB, which has decided to finance the BRT system to be developed in the north-south corridor, co-financing and coordination with the implementation mechanisms including creation of an operating unit, are necessary. If the interest of European companies becomes stronger, aid organizations such as the European Bank for Reconstruction and Development (EBRD) will be possibly proactive to support the metro project. A strategic approach to these organizations must be made.

11.3.5 Establishment of a Project Support Mechanism by the Japanese Side

After the political commitment is made by the Mongolian government to realize the metro project, the relevant parties will take the next actions. Japan also needs to develop a concrete structure for the support of the project.

(1) Continuous Support for Project Formulation

JICA's continuous support is desirable to assist the decision-making and coordination of the Mongolian stakeholders in the two-level organization described in Table 11.1 and the development of an implementation mechanism for the realization of the project. Since 2007, JICA has conducted the Ulaanbaatar Urban Development Master Plan Study. This metro project was proposed as one of the highest and most important priority projects, and the Mongolian government expects continuous support from Japan for the realization of this project. To meet their expectations and follow up with the establishment of the implementation mechanism, continuous inputs of Japanese experts for at least 10 months (June 2013 and April 2014) are essential.

Purposes of the Expert Team's follow-up activity are:

(1) Technical advice for policy-making and coordination with relevant authorities;
(2) Further study on project implementation mechanisms;
(3) Support for the establishment of the UBMC;
(4) Preparation of a Japanese Engineering Service (ES) Loan to conduct D/D for the infrastructure development; and
(5) Continuous support to manage JCC and Working Group.

Fields of Experts to be included are:

- Leader (Overall management)
- Senior engineer (Infrastructure of the metro system)
- Urban planner (Station and underground development)
- Financial planner (Fund procurement and risk package preparation)
- Railway Expert (Metro operation, organization and capacity development)
- Other experts (Environmentalist and Geologist)

(2) Confirmation of a Strategic Partner and Establishment of a Comprehensive Management Team

In parallel with the continuous support to the Mongolian side, a strategic partner team consisting of mainly Japanese companies must be established. The strategic partner team will function as a part of the implementing body of the metro project in cooperation with the Mongolian government. In this sense, the members of the team are assumed to invest in UBMC. The members from Japan is composed of companies which have at least the following four functions:

- Comprehensive consulting services including project management, financing, legal systems, and international finance;
- Metro operation (Railway operator);
- Construction management; and
- Procurement support.

On the other hand, the Mongolian strategic partner is expected to be responsible for the following roles to promote the business and commercial development in the metro stations and station areas:

- Station-related and utility services;
- Station plaza development; and
- Other commercial services related to the metro.

Based on the Concession Law, there is a possibility that the selection of the strategic partner of UBMC needs to be done through a competitive bidding. If this applies, Japanese members must win the tender to formulate the strategic partner scheme.

(3) Commitment of JICA Japanese Yen Loan for Detail Design (D/D) and Infrastructure Development

Once this project is approved as a national priority project and the government makes a decision of the project implementation, the detail design (D/D) of the infrastructure component will be the next step. The D/D is a package of engineering services, including:

(1) Detailed geological surveys;
(2) Detailed design for all infrastructure facilities and stations;
(3) Review of the project costs and the procurement scheme;
(4) Preparation of all tender documents;
(5) Review and improvement of related legal framework (the Railway Law and new regulations for “Underground Development”); and
(6) Preparation of ODA loans for the infrastructure construction.

Possible finance sources for the engineering services above are two:

A: Mongolian state budget; or

B: Engineering Service (E/S) loan[1] by JICA.

Needless to say, the first option is the most desirable. However, it is hard for the Mongolian government to conduct the detail design of the infrastructure development by itself because the project is the first urban transport system in Mongolia. Therefore, direct and indirect instructions should be given to them by experienced countries. Thus, the second option is recommended to be chosen on the assumption of Japanese technical support.

[1] Loan conditions: Annual interest rate: 0.01%; Payback years: 25 years; Grace Period: 7 years; Procurement: Tied.

Since all external loans are required to obtain an approval from the Parliament in the Mongolian side, the official request for the ES loan should be made as soon as possible, or within 2013. Otherwise, the loan cannot start in 2014. It is noted that in order to procure the JICA ES loan, the Mongolian government is requested to make an official request for a Japanese Yen loan for the metro's infrastructure portion.

Regarding JICA's support, there is another option that the D/D work be granted by JICA, only when the Mongolian government requests a STEP loan[2] for the infrastructure development project in advance. However, this option usually takes a long time for JICA's technical appraisal prior to the official commitment. On the other hand, it may be hard for the Mongolian side to make a decision on the use of JICA-STEP loan before the D/D work is completed. Therefore, the grant option is not necessarily recommendable.

(4) Support by Development Finance

As proposed, the infrastructure component of the metro is partially implemented with a Japanese Yen loan. However, an ODA ratio of the total project cost should be less than 50% on the assumption that it is difficult to appropriately and sustainably manage the project without the proactive involvement of the Mongolian government. Samurai bonds (Yen bonds) are another option to use for a portion of the infrastructure when the Mongolian government takes responsibility in financing the project . In order to issue the bond, a guarantee from JBIC is required and such kind of support from the Japanese government is necessary.

Japan's proactive support is also needed for the investment and loans to the UBMC in charge of the procurement of the train system and the transport services including the human resource development. When the export financing is utilized for the procurement of the rolling stock, loan conditions (e.g. it should be applied only for rolling stock made in Japan) must be met. The study team continues to examine and discuss in detail the possibility of utilization of the export financing.

11.4 Recommendations on Time-Schedule for Starting the Project

All the works for the project preparation need to be completed by 2016 at the latest, based on the metro opening target year of 2020. Fortunately, the current administration will continue until 2016 and it helps the metro project to do the various preparation before the next elections. In Mongolia, possibly, the change of the administration affects directly and indirectly the progress of a large project like the metro, and therefore, in order to make the project successful, it is essential to complete the various preparation and formalities by 2016. Figure 11.4.1 indicates formalities and activities, and the rough schedule, which need to be completed during the preparatory period before the construction of the infrastructure.

[2] STEP stands for Special Terms for Economic Partnership. Its loan conditions are: annual interest rate: 0.1%; Payback years: 40 years; Grace period: 10 years; Procurement: tied; a special condition: more than 30% of the procurement shall be covered by Japan-origin goods.

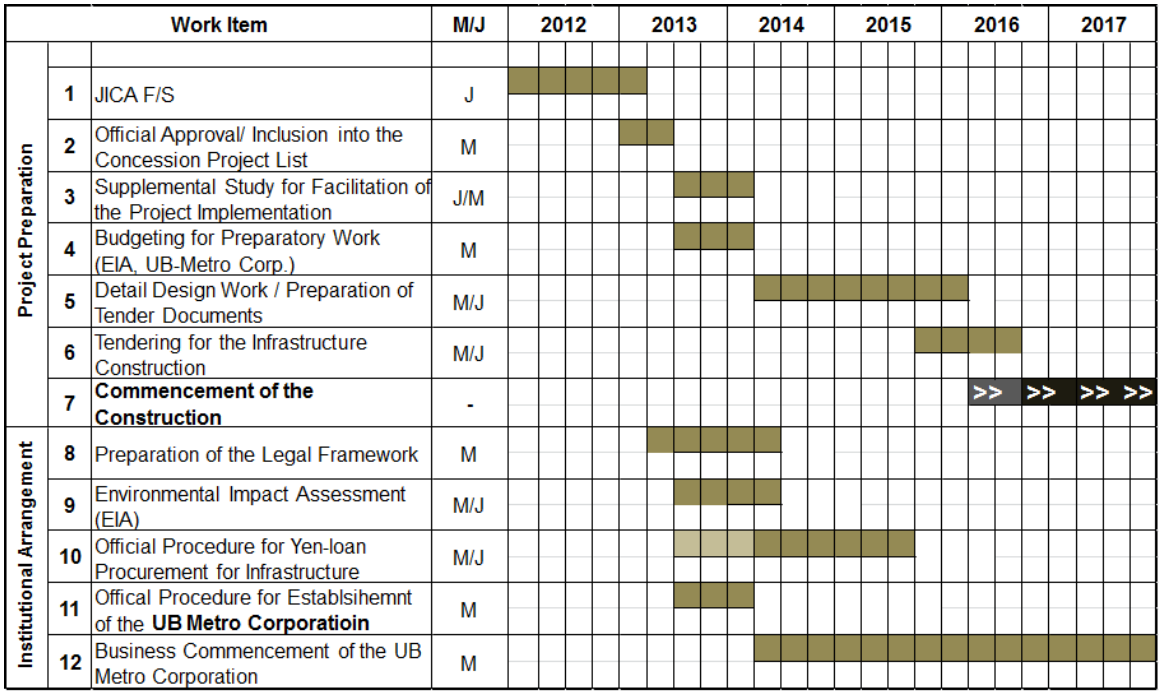


Figure 11.4.1 Possible Time-schedule for Project Preparation Period

Based on the result of an interview survey conducted by the Study Team, 95% of the 2,000 respondents showed their support for the realization of the metro project. The Mayor of Ulaanbaatar city expressed a political will for the introduction of the metro. The memorandum between the Mayor and the Minister of Roads and Transportation in November 2012 addressed that both the ministry and the city government would cooperate for its realization. The Mongolian side needs the support from Japan in order to develop the metro with the advanced and trusted technology. For the Japanese side, the public-private partnership needs to be structured towards the realization of the metro project, and the private companies of the Study Team show a strong will to be a strategic partner of the metro project.