< Appendix>

Appendix-1

Minutes of Discussion on Preparatory Survey for the Construction of Ajilchin Flyover Project in Ulaanbaatar City

MINUTES OF DISCUSSION
ON
PREPARATORY SURVEY
FOR
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF FINANCE OF MONGOLIA,
MINISTRY OF ROAD, TRANSPORTATION, CONSTRUCTION AND URBAN DEVELOPMENT OF MONGOLIA,
ULAANBAATAR CITY GOVERNMENT

Ulaanbaatar, 7 December, 2011

The Japan International Cooperation Agency (hereinafter referred to as "JICA") exchanged views and had a series of discussions with Ministry of Finance of Mongolia (hereinafter referred to as "MOF"), Ministry of Road, Transportation, Construction and Urban Development of Mongolia (hereinafter referred to as "MRTCUD"), and Ulaanbaatar City Government (hereinafter referred to as "UBC") on the draft implementation plan of JICA Preparatory Survey for the Construction of Ajilchin Flyover Project in Ulaanbaatar City (hereinafter referred to as "the Project").

JICA and MOF, MRTCUD, UBC hereby agreed upon the draft implementation plan of the Preparatory Survey of the Project as per Annex, subject to the approval by the competent higher authorities of both sides.

It should be noted that implementation of the Preparatory Survey does not imply any decision or commitment by JICA to extend its loan for the Project at this stage.

Annex: Draft Implementation Plan

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State Secretary
Ministry of Road, Transportation, Construction and Urban Development of Mongolia

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Japan International Cooperation Agency in Mongolia

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Munkhbaatar Begzjav
Vice Mayor,
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Annex

DRAFT IMPLEMENTATION PLAN
ON
JICA PREPARATORY SURVEY
FOR
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY

1. Background

Currently, the population in Ulaanbaatar City (UB) accounts for more than 40 percent of population of Mongolia, and the south of UB has developed quickly with economic and population growth. As its economy and population grow, the traffic volume has increased rapidly, and it is expected to increase further continuously. Moreover, the railway and the Dund River flowing east to west divide the city into two parts, the north and south, which aggravate traffic congestion and constrain economic activity and livelihood. Therefore in order to mitigate the traffic congestion and promote economic activity, it is vital to construct a new bridge over the railway and the Dund River to link the north and the south.

According to "MDGs based National Development Strategy (2007-2021)", it is highly prioritized to improve road network in UB. Also, in "the Mid-term Program of new construction in Mongolia", construction of railway flyover (at least seven flyovers) in UB including Ajilchin railway flyover is stated as one of the priority actions.

Based on the situation stated above and the result of mutual discussions with the authorities concerned of Mongolia, JICA decided to conduct the Preparatory Survey on the Construction of Ajilchin Flyover Project in Ulaanbaatar City (hereinafter referred to as "the Survey").

2. Outline of the Survey

(1) The Area covered by the Survey

The area covered by the Survey is shown in Appendix-1

(2) Implementation Structure

The responsible agency for executing the Survey is the Ministry of Road, Transportation, Construction and Urban Development of Mongolia (MRTCUD)

The executing agency is Road Agency of MRTCUD, the Governor's Office and the Road Department in UBC (hereinafter "the executing agency")

(3) Scope of the Survey

1) To produce results of feasibility study of the Project (e.g. Design Report, Drawing, Implementation Plan etc.)
2) To propose technical cooperation plan for the capacity development of the quality control and operation and maintenance (O/M) of road and bridge
3) To propose prioritized rehabilitation plan of existing bridges in UB

3. Terms of Reference of the Preparatory Survey

(1) Confirmation of the Needs and Background of the Project

1) To confirm the background and rationales of the Project with the considerations of national policy on road and bridge in Mongolia
2) To review and collect the existing study results and relevant documents of the Project
3) To review the legal framework (regulations and rules) of the road and bridge sector in Mongolia
4) To assess the executing agency's organizational structure, jurisdiction and their expertise
5) To confirm budget status and experiences of road and bridge construction, O/M of the executing agency.
6) To confirm other donors' relevant projects

(2) Confirmation of the Project Site Situation

1) To confirm the current condition of the Project site by meteorological, geological and topographic survey
2) To conduct survey of the current traffic condition and analysis of demand forecast of traffic volume
3) To inspect the existing roads and bridges in UB as listed in Appendix-2
4) To confirm the location, depth and type of the existing utilities by site survey and exploratory excavation (if needed)

(3) Basic Design of New Bridge(s)

1) To compare several alternatives of the candidate alignments / routes of Ajilchin Flyover (including approach road) and propose an appropriate design
2) To compare several alternatives of the candidate bridge type and propose an appropriate bridge type
3) To confirm the needs for improving access road(s) within the 1st intersection from Ajilchin Flyover
4) To develop the basic design of Ajilchin Flyover, approach road, necessary access road(s) and facilities
5) To develop the outline design of relocation and/or protection of existing utilities
6) To conduct survey of scour depth, and basic design of protection works of river bank and bed against the scour (if needed)

(4) Implementation Plan of the Project

1) To develop the construction executing plan and measures
2) To develop the procurement plan (including proposal of procurement package and methods)
3) To collect information on the number and experience of local contractors in UB
4) To propose the implementation schedule of the Project
5) To estimate the Project cost
6) To propose the implementation set-up with definite roles and responsibilities of the executing agency and other relevant organizations with the consideration of the current organizational system

7) To propose the details of consulting services
8) To propose the necessary O/M framework and structure for the Project in terms of technical and financial sustainability
9) To analyze the economic and financial viability of the Project

(5) Environmental and Social Impact

1) To analyze environmental and social impacts of the Project and propose mitigation measures and monitoring plan in accordance with the requirements of Mongolian laws and regulations and JICA's "Guideline for Environmental and Social Consideration"
2) To prepare the necessary documents and forms submitted to agency responsible for environmental and social impact in Mongolia

(6) Technical Cooperation Plan and Bridge Rehabilitation Plan

1) To confirm the needs for technical cooperation for the purpose of capacity development regarding quality control and O/M of road and bridge
2) To prioritize rehabilitation plan of existing bridges in UB
3) To hold a seminar on quality control and O/M of road and bridge (if needed)

(7) Evaluation of the Project

1) To propose operation and effect indicators (e.g. traffic volume, travel time reduction, travel velocity improvement) and monitoring plan
2) To collect baseline data of operation and effect indicators
3) To evaluate the qualitative and quantitative effects of the Project

(8) Conclusion and recommendations

4. Implementation Framework of the Survey

(1) Structure of the Survey team (Tentative)

JICA will select and dispatch the Survey team to carry out the Survey.

The team will include the following experts.

- Team Leader / Transportation Planner
- Bridge Engineer
- Road Engineer
- Execution / Implementation Planner / Existing Utilities Survey Specialist
- Natural Environment Survey Specialist
- Procurement / Cost Estimate Specialist
- Economic and Financial Analyst
- Environmental and Social Impact Consideration
- Road / Bridge Inspection Specialist / Technical Cooperation Planner
- Coordinator

The Survey team might employ local consultants, NGOs, and/or other supporting staffs.

(2) Survey Implementation Schedule (Tentative)

December 2011	- Signing of Minutes of Discussion
December 2011 - February 2012	- Selection of consultants by JICA
March 2012	- Mobilization of Survey Team
	- Submission of the Inception Report
	- Inception Report Mission
June 2012	- Submission of the Progress Report
	- Progress Report Mission
September 2012	- Submission of the Interim Report
	- Interim Report Mission
December 2012	- Submission of the Draft Final Report
	- Draft Final Report Mission
February 2013	- Submission of the Final Report

(3) Reports

1) Inception Report

20 copies will be submitted at the commencement of the first work period written in Mongolian.

2) Progress Report

20 copies will be submitted 3 month after the commencement of the Preparatory Survey written in Mongolian.

3) Interim Report

20 copies will be submitted 6.5 month after the commencement of the Preparatory Survey written in Mongolian.

4) Draft Final Report

20 copies will be submitted at the end of the last work period written in English and Mongolian. MOF, MRTCUD, and UBC will submit its comments within 1 month after the receipt of the Draft Final Report.

5) Final Report

20 copies will be submitted within 1 month after the receipt of the comments on the Draft Final Report written in English and Mongolian.

(4) Monitoring

The Survey team's work will be subject to periodic review by JICA. The JICA staff will attend meetings with Joint Coordinating Committee (JCC) and/or other organizations concerned during the implementation of the Survey may also attend the meetings if necessary.

(5) Guideline for Environmental and Social Consideration

the executing agency agreed to abide by "JICA Guideline for Environmental and Social Considerations" (April 2010) (http://www.jica.go.jp/english/operations/social_environmental/guideline/pdf/guideline100326.pdf) in order to ensure that appropriate considerations will be

made for the environmental and social impacts of the Project.

5. Undertakings by executing agency and other organizations concerned

the executing agency and other relevant organizations will undertake the followings in order to assist the implementation of the Survey on schedule, through close cooperation with the authorities concerned with Government of Mongolia (hereinafter referred to as "GOM"):

(1) To furnish the Survey team with all available and relevant data, information and documents requested by the Survey team

(2) To assign counterpart personnel

(3) To provide meeting space during the stay of the Survey team.

(4) To ensure issuance of entry permits necessary for the Survey team members to conduct field survey

(5) To ensure safety of the team members, if and when required

(6) To assist the team in making transportation arrangements

(7) To assist the team in medical services as needed

(8) To assist the team to obtain other privileges and benefits if necessary

(9) To establish Joint Coordinating Committee (JCC) for effective and successful implementation of the Survey, whose functions and composition are described in Appendix-3

6. Others

1) The nature of the services to be rendered by the Survey team shall be exclusively advisory, with all decisions as to whether to accept or implement any recommendation(s) made or instruction(s) given in the course of the implementation of the services shall be the responsibility of the executing agency and other authorities concerned of the GOM.

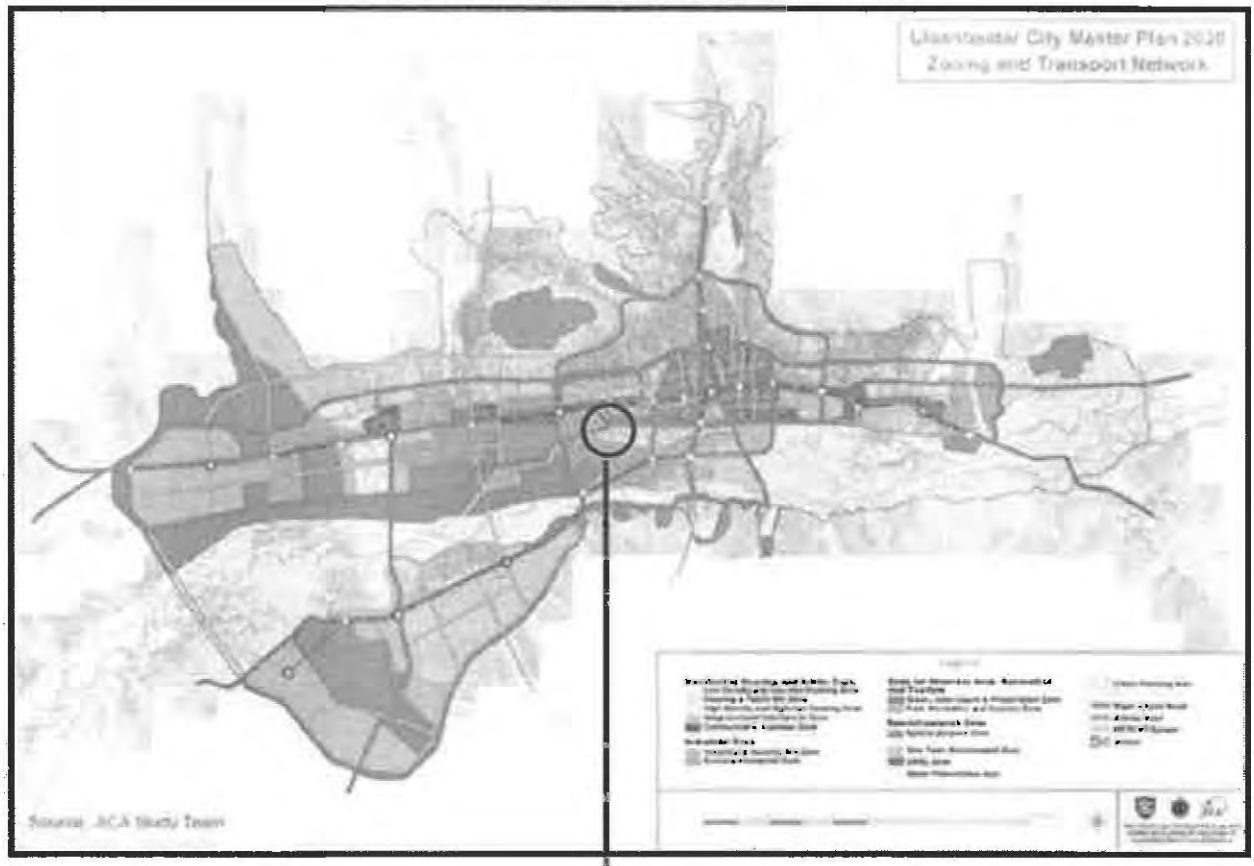
2) the executing agency and other authorities concerned of the GOM shall take, with their own responsibility, all the necessary measures for the utilization of the recommendations and outcomes of the survey in the JICA financed projects.

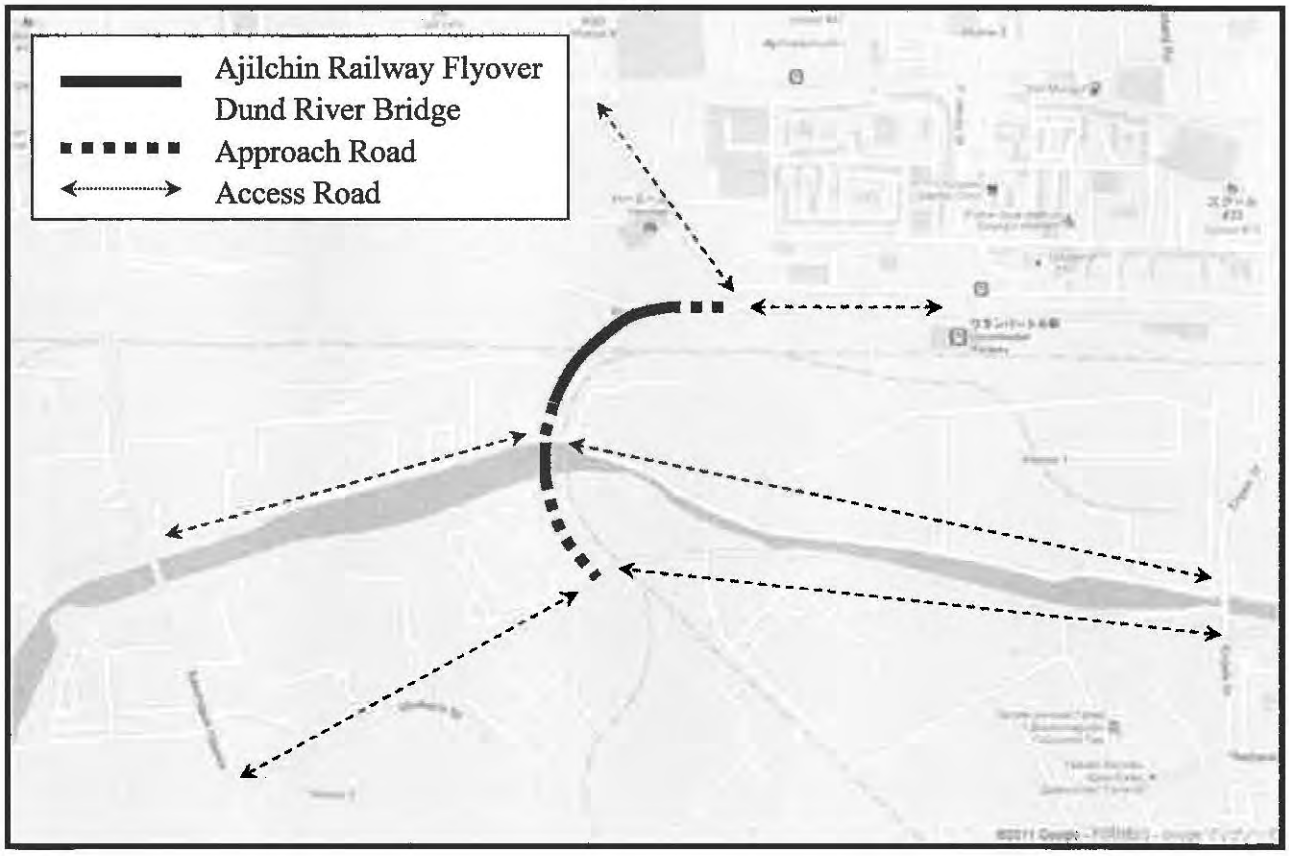
3) The Study team will propose the needs for the specific Japanese technics and/or materials in light of safety, economic and smooth implementation of the Project.

(end)

Appendix-1

Location Map Covered by the Survey





Appendix-2

Existing bridge list in UB

No	ID No.	Bridge name	Dimension		Constructed year	Type	Year made rehabilitation and maintenance
			L(м)	W(м)			
Middle size bridges /25-100м length/							
1	4	Arslantai Bridge	52	13	1962	RC	
2	5	Uliastai tsaad Bridge /Left/	97	8+1.0*2	1967	RC	2010
3	6	Uliastai tsaad Bridge	60	8	1985	RC	
4	16	Tolgoit Parallel Bridge	72		1987	RC	2010 maintenance
5	17	Selbe dund bridge	51.12	9.0+1.5	2002	RC	
6	18	Dund gol Deed bridge	60.4	9+1.5*2	1975	RC	
7	22	Dund gol Dund bridge	44		1961	RC	
8	23	Dund gol Dood bridge	67.95	11x2+3+1.5x2	1975	RC	
9	25	Turgen river bridge	39.75	10.5+1.5*2	1987	RC	
10	28	Naran brdge	36	10.5+1.5*2	1986	RC	
11	29	Bridge behind Meat Factory	54	10.5+1.5*2	1986	RC	
12	34	Sharga morit bridge	50.4	7+0.75*2	1982	RC	
13	35	Selbe gol Deed parallel-1	58	7.5+0.75*2	1963	RC	
14	36	Selbe gol Deed parallel-2	55	7.5+1.25*2	1982	RC	
15	37	Selbe gol Dund bridge	33	16	1963	RC	
16	38	Bridge behind Chinggis hotel	45		1990	RC	
17	41	Gachuurt bridge	30		1984	RC	
18	44	Nalaikh bridge	27			RC	
19	50	Baruun-uul Dithc bridge	27.67			RC	
20	58	Damdinsuren street bridge over the Selbe river	48.8		2009	RC	
21	39	Dambadarjaa bridge	60	8+1*2	1995	RC	
22	60	New rightside bridge of the Uliastai river bridge to become parallel	97		2010	RC	
23		Morin/Horse/ hill bridge	27		2009	RC	
23			**1193.09**				
Small size bridges /less than 25 м length/							
1	7	Uliastai tsaad bridge	18	8	1963	RC	
2	8	Bridge over the Hol river	21	8	1963	RC	
3	9	Chuluut am bridge	11	8+1.25*2	1963	RC	
4	11	Zaisan West am bridge	18	7.5	1971	RC	
5	12	Bridge in front of the 14 khoroolol	20	7+0.75*2	1963	RC	
6	15	Yarmag bridge to Airport	10	8+1.25*2	1961	RC	

7	20	Ikh Tenger dood bridge	12	7.5	1979	RC	
8	30	Nairamdal bridge	18	7.5	1986	RC	
9	31	Rashaant bridge	12	8+0.75*2	1991	RC	
10	32	Khailaast	24	18+3.0*2	1987	RC	
11	33	Chingeltei	24	18+3.0*2	1987	RC	
12	40	Dambadarjaa naad bridge	24.1	8+1.1*2	1990	RC	
13	42	Gachuurt bridge	18		1984;1988	RC	
14	43	Ikh Tenger deed bridge	17.5	8+0.75*2	1979	RC	
15	45	Zaisan East bridge	12	8+0.3*2		RC	
16	48	Milk factory bridge	15.8	14+4.55*2		RC	
17	52	Bridge to Khandgait-Sanzai	9		2004	RC	
18	53	East Bridge to Khandgait-Sanzai	9		2004	RC	
19	54	Tolgoit ger area road bridge	18		2004	RC	
20	55	Tolgoit Zuun salaa road bridge	12		2004	RC	
21	56	Bridge behind the 1 st district	18		2006	RC	
22	51	Bridge over the ditch behind the 1st khoroolol	16,5		2007	RC	
23	57	Naran river bridge	23.4		2009	RC	
24	59	Bridge over the ditch west of the 39-th secondary school	10.6		2010	RC	
25		Khailaast 1.1 km length road bridge-1	9		2011	RC	
26		Khailaast 1.1 km length road bridge-2	9		2011	RC	
26			**396.4**				
Large bridges /more than 100м length/							
4	13	Enkhtaivan bridge	339.5	16.8	1961	RC	2006
5	27	Gurvaljin birdge	108	12*2	1989	RC	2009-2010
6	24	Sonsgolon bridge	297	8+1*2	1971	RC	
7	14	Yarmag bridge	259.4	8.5+1.5*2	1961:1967	RC	
8	19	Ikh Tenger bridge	258	11.5+1.5*2	1994	RC	2008-2010
9	26	Poultry farm bridge	256	8	1989	RC	
10	10	Bayanzurkh bridge	252.6	7+0.75*2	1967	RC	2009
11	21	Zaisan bridge	224	9+1.5*2	1971	RC	
11			**1994.5**				
60		**Total length**	**3584.0**				

Appendix-3

Joint Coordinating Committee

1. Functions

To review the study on inception, progress, interim, draft final and final report
To exchange views on major issues arising during the Survey
To approve the modification to activities depending on the necessity
To identify the scope of proposed project

2. Composition

Chairperson: State Secretary, Ministry of Roads, Transport, Construction and Urban Development (MRTCUD)
Vice Chairpersons: Vice Mayor, Municipality of Ulaanbaatar
Secretariat: Head, Planning and Research Division of Road Department in UB City

Members:

(1) Mongolian Side

- Director General, Department of Development Financing and Cooperation, Ministry of Finance

MRTCUD

- Director General, Road and Transportation Policy Department
- Director General of the Department of Finance and Investment
- Member, National Development and Innovation Committee
- Chairperson, Railway of Authority
- Director, Ulaanbaatar Railway
- Director General, Road Agency

UB City

- Head, City Development Policy Department
- Head, Road Department
- Head, State Finance and Treasury Department
- Head, Department of Land Administrations
- Head, Construction Urban Development Planning Department
- Head, Urban Planning, Architecture and Design Institute of Ulaanbaatar City
- Head, Division of Engineering Facilities
- Head, City Property Relations Department
- Head, Environmental Protection Department

Relevant personnel accepted by the Chairperson, if necessary

(2) Japanese Side

- Chief Representative, JICA Mongolian Office
- JICA Experts
- Other personnel concerned, to be dispatched by JICA, if necessary

Appendix-2

Minutes of Discussion on 1st Joint Coordination Committee Meeting

RECORD OF DISCUSSION
ON
ADDITIONAL EXPLANATION
REGARDING
1ST JOINT COORDINATION COMMITTEE MEETING
FOR
THE PREPARATORY SURVEY ON
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY

25 September, 2012

In order to facilitate understanding of former discussion on the captioned project for new Vice Mayor, the meeting for additional explanation regarding 1st Joint Coordination Committee (JCC) was held among Vice Mayor of Ulaanbaatar City, JICA, and JICA Study Team based on "Minutes of Discussion on 1st Joint Coordination Committee Meeting for the Preparatory Survey on the Construction of Ajilchin Flyover Project In Ulaanbaatar City" dated July 17, 2012. Following issues discussed under 1st Joint Coordination Committee Meeting were explained and mutually agreed among the attendants.

1) **Route of the Bridge**: East-West (EW) Route could be the most appropriate and advantageous route as agreed upon the 1st JCC Meeting.
2) **Scope of the Study**: JICA Study Team shall carry out the Feasibility Study based on the selected route starting from Ajilchin Street up to Narny Road which is approximately 2200m in length as agreed upon the 1st JCC Meeting.
3) Ulaanbaatar City shall be in charge of organization of Working Group, and shall coordinate with Ministry of Road and Transport to organize 2nd JCC meeting to be held in the middle of October 2012.

<Attendants>
Mr. Nyamdavaa Gantumur, Vice Mayor of Ulaanbaatar City
Mr. Tomihara Takayuki, Project Adviser, JICA
Mr. Maruoka Kenji, JICA Expert
Mr. Okazaki Akio, Deputy Team Leader of JICA Study Team

Concurred by

Nyamdavaa Gantumur,
Vice Mayor of Ulaanbaatar City

MINUTES OF DISCUSSION
ON
1ST JOINT COORDINATION COMMITTEE MEETING
FOR
THE PREPARATORY SURVEY ON
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY

17 July, 2012

1st Joint Coordination Committee (here in referred to as "JCC") Meeting for the Preparatory Survey on the Construction of Ajilchin Flyover Project in Ulaanbaatar City (hereinafter referred to as "the Study") was held on the 3rd day of July, 2012 with the attendance of the JCC members who represent Ministry of Road, Transportation, Construction and Urban Development of Mongolia (hereinafter referred to as "MRTCUD"), Ulaanbaatar City Government (hereinafter referred to as "UBC"), Japan International Cooperation Agency (hereinafter referred to as "JICA") and JICA Study Team of the Preparatory Survey on the Construction of Ajilchin Flyover Project in Ulaanbaatar City (herein referred to as "the Study Team").

The Study Team and the JCC members exchanged views on the bridge route and scope of the Study and hereby agreed upon these issues as summarized in Annex-1. Based on the consent, the Study Team will proceed to stage-II of the Study to formulate the outline of the Project such as bridge type, number of lanes and design criteria as well as to prepare the basic design of new bridge which will be proposed in the Interim Report by the end of September 2012.

Jadamba Bat Erdene
State Secretary, MRTCUD

Munkhbaatar Begzjab
Vice Mayor, Ulaanbaatar City

ISOGAI Toshimori
Chief Representative
JICA Mongolia Office

NAGATA Tsunemi
Team Leader of JICA Study Team

Annex-1

1. Route of the Bridge

Based on a comparative study on three (3) alternative bride routes; namely, 1) East -West (EW) Route, 2) North-South (NS) Route, and 3) Combination of EW and NS, it was concluded that 1) East-West (EW) Route could be the most appropriate and advantageous route in terms of prospective traffic demand, estimated project cost, land acquisition for ROW, and so forth.

2. Scope of the Study

Subsequent to conclusion of bridge route, the Study Team shall carry out Feasibility Study (FS) on the Project of Ajilchin Flyover Construction as defined by the scope given below and shown in Figure 1.

(1) The road length to be covered by the Feasibility Study shall be approximately 2,200m starting from the intersection of West Industrial Street and Ajilchin Road, and ending at the intersection of Narrny Road in front of Ulaanbaatar Railway Station.

(2) Ajilchin Flyover shall connect Narrny Road and West Industrial Road crossing railway and its feeder lines.

(3) Intersection plan shall incorporate three intersections; namely, 1) at Ajilchin Street, 2) near railway branch, and 3) at Narrny Road.

(4) Design of Dund River Crossing Bridge would be excluded from the Feasibility Study.

3. Other Issues

(1) Grade separation at the intersection of Narrny Road might be proposed depending on analytic examination of traffic demand forecast as well as economic efficiency during the Study.

(2) The Study Team was requested to provide certain ideas to mitigate traffic congestion along West Industrial Road which has been induced mainly by heavy duty traffics.

(3) Consideration should be given to the physical constraints such as railway double track plan at the vicinity of Ulaanbaatar Station and underground sewage pipes near the railway.

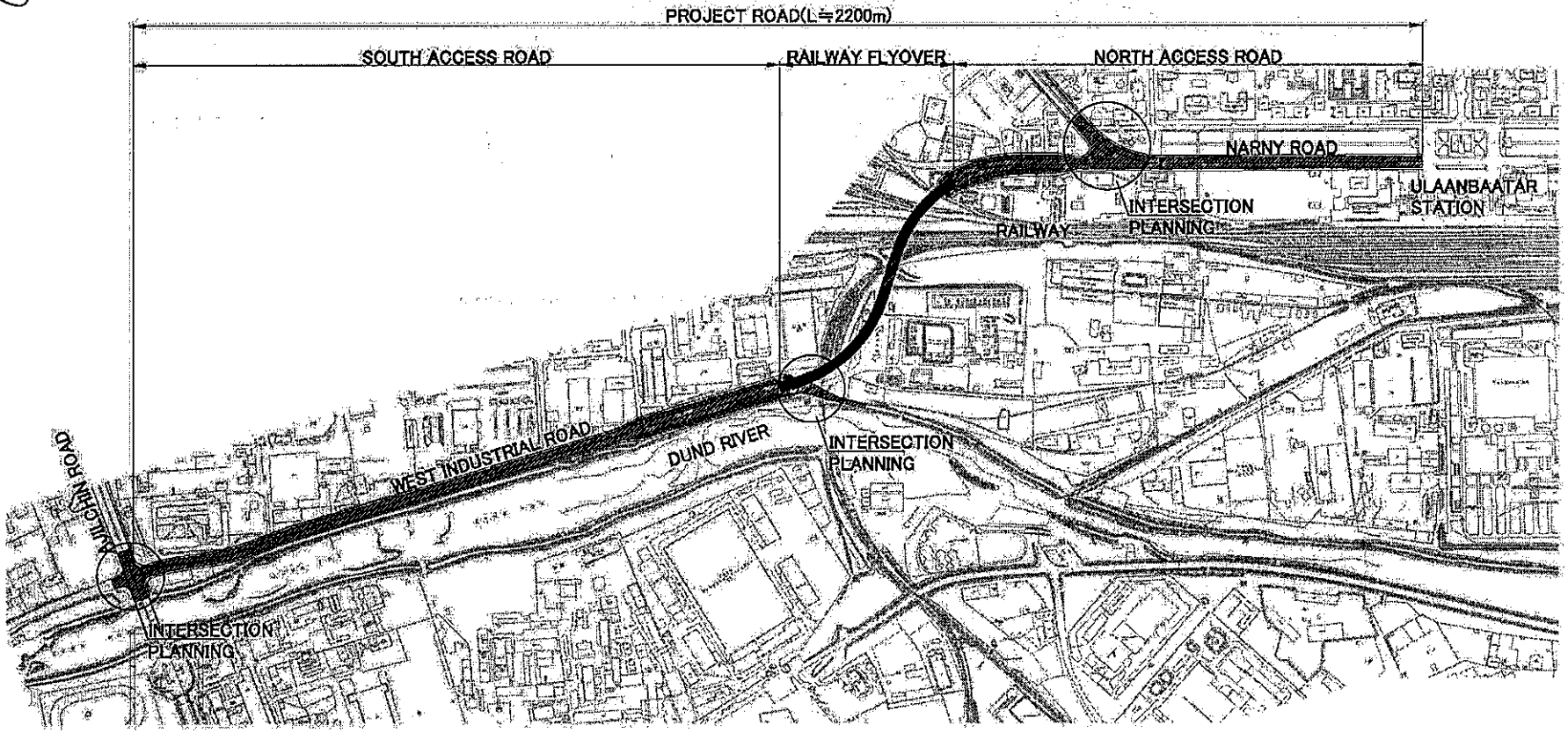


Figure-1 Study Area and Scope of the Project

Appendix-3

Minutes of Discussion on 2nd Joint Coordination Committee Meeting

MINUTES OF DISCUSSION
ON
2nd JOINT COORDINATION COMMITTEE MEETING
FOR
THE PREPARATORY SURVEY ON
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY

9 November, 2012

The Second Joint Coordination Committee (JCC) Meeting on the Preparatory Survey for the Construction of Ajilchin Flyover Project in Ulaanbaatar City, Mongolia (hereinafter referred to as "the Study") was held on the 7th day of November 2012 with the attendance of the JCC members representing the Ministry of Roads and Transportation (MRT), representatives of the Ulaanbaatar City Government (UBC), representatives of Japan International Cooperation Agency (JICA), and members of the JICA Study Team conducting the Preparatory Survey for the Construction of Ajllchin Flyover Project in Ulaanbaatar City (the Study Team).

The Study Team and the JCC members exchanged views on the outline of the Project such as road planning, general condition of bridge and design criteria, and confirmed the issues as summarized in Annex-1. Based on the conclusion of this 2nd JCC meeting, the Study Team will proceed to Stage-III of the Study to prepare the basic design of the new bridge, cost estimate and project evaluation which will be presented in the Draft Final Report to be submitted by the middle of January 2013..

Baasandorj. BATZAYA
State Secretary
Ministry of Roads and Transportation

Nyamdavaa GANTUMUR
Vice Mayor, Ulaanbaatar City

ISOGAI Toshinori
Chief Representative
JICA Mongolia Office

OKAZAKI Akio
Deputy Team Leader
JICA Study Team

1. ROAD PLANNING

(1) No specific objection was given to the following concepts on road planning presented by by the Study Team in the 2nd JCC meeting.

- Intersection of Ajilchin Flyover and Narny Road shall be grade-separation to mitigate traffic congestion, while the bridge length be extended more than 200m and construction cost increase.
- Existing West Industrial Road and the new road to be constructed in the Project shall be separated to prevent traffic congestion. The existing West Industrial Road shall be operated as "service road" for the users of roadside facilities, and the new arterial road connecting to the Ajilchin flyover shall be constructed for the Through-Traffic at the south side of the existing road, together with the new river dike along the Dondgol River.

(2) Grade-separation at the intersection of Ajilchin Road and new road was proposed by JCC member. The proposal shall be taken in consideration as future plan which would improve and widen the Power Plant Road to 4-lane road. The Draft Final Report shall include this point of view as recommendation to be undertaken in the future.

(3) 4-lane road shall be recommended in terms of traffic demand, the condition of connecting road and cost-efficiency. 6-lane can not be adopted to existing access road due to physical constraints.

(4) It was confirmed that the project road was planned taking into consideration of future road plan and Master Plan of Ulaanbaatar City to formulate effective road network although the Regional Development Plan of the project site has not developed.

2. ENGINEERING DESIGN CRITERIA

The Criteria for the engineering design of road and bridge shown in Chapter 7 of the Interim Report were explained by the Study Team. It was advised by JCC members that engineering justification within the scope of conclusion made among 1st and 2nd JCC meeting would be confirmed by "the Science and Technology Council (STC)" in the MRT. According to the advice of JCC, the MRT shall be responsible for organizing the STC to approve the design criteria not later than the middle of December 2012. The Study Team shall be participated in the STC if required.

3. FUTURE PLAN OF RAILWAY

It was confirmed that information regarding future plan of railway such as railway diversion plan and double truck plan had been exchanged by and between Ulaanbaatar Railway

(UBTZ) and the Study Team. Location of piers and foundation of bridge was proposed based on the above information and it has been principally agreed by UBTZ.

4. LAND ACQUISITION AND RESETTLEMENT

(1) Land acquisition and relocation of buildings possessed by the Ulaanbaatar Railway (UBTZ) in the Right-of-Way for the Project was presented by the Study Team. JCC members requested to the Study Team to present the result of asset valuation to be compensated under the Project.

(2) Road alignment shall be adjusted to preserve the apartment building located in the vicinity of the intersection of Ajilichin Street and West Industrial Road from the view point of impact on social environment and its cost-efficiency. Land acquisition as a consequence of the above road alignment should be undertaken by Ulaanbaatar City.

(3) Detailed survey on land acquisition and compensation shall be carried out by the Study Team. Land Acquisition Report prepared by the Study Team shall be examined by Ulaanbaatar City to confirm validity of the cost for the compensations.

5. GENERAL CONDITIONS OF THE NEW BRIDGE AND STRUCTURES

No specific objection was given to the following proposals on the general conditions of the new bridge and related structures made by the Study Team based on site condition survey and comparative studies.

(1) Total length of new bridge is 828 m with four (4) lanes.

(2) Type of bridge superstructures considering cost, construction period and site conditions have been selected as below;

- At curve section from A1 to P11: Multi-Steel Box Girder Bridge
- At straight section from P11 to A2: Steel-I Girder Bridge

(3) The following advanced construction technologies developed in Japan will be effectively adopted utilizing their respective advantages:

- "Steel-Concrete Composite Deck Slab" shall be adopted due to advantages in terms of reliability of construction quality, construction period and durability.
- "Rotary Penetration Steel Pipe Pile" shall be used for foundation in the vicinity of railway track to minimize influence due to construction work.
- Bridge erection by "Launching Method" shall be adopted on the main railway track to minimize disturbance in railway traffic.

(4) No sidewalk beside the new bridge shall be required since the existing pedestrian bridge is located near the project site and less pedestrian has been passing through.

6. RELOCATION OF UTILITIES

Based on the series of discussions previously made between the Study Team and the respective utility agencies, such as those for electric power supply, heating pipe, water supply pipe, sewage, communication cable and network cable for railways, it was confirmed that the relocation of utilities for the Project would be required and that the relocation plans and approximate cost estimates should be provided by all of the concerned agencies to the Study Team not later than the 15th day of November 2012 to include such information in Draft Final Report.

7. OTHER ISSUES

Following requests were presented by JCC members.

(1) JCC members will carry our field reconnaissance together with Ulaanbaatar City Government to understand the site situation.

(2) Project Cost consists of Construction Cost, Consultant Fee, Land Acquisition, Utility Relocation and Tax related to the Project shall be presented in the Draft Final Report.

(3) Organization and its responsibility for implementation of the Project shall be clarified in the Draft Final Report.

Appendix-4

Minutes of Discussion on 3rd Joint Coordination Committee Meeting

MINUTES OF DISCUSSION
ON
3rd JOINT COORDINATION COMMITTEE MEETING
FOR
THE PREPARATORY SURVEY FOR
THE CONSTRUCTION OF AJILCHIN FLYOVER PROJECT
IN ULAANBAATAR CITY

27 February, 2013

The Third Joint Coordination Committee (JCC) Meeting for the Preparatory Survey for the Construction of Ajilchin Flyover Project in Ulaanbaatar City, Mongolia, which was continued from 4th WG meeting, was held on the 27th day of February 2013 with the attendance of the JCC members representing the Ministry of Roads and Transportation (MRT), representatives of the Ulaanbaatar City Government (UBC), representatives of Japan International Cooperation Agency (JICA), and members of the JICA Survey Team conducting the Preparatory Survey for the Construction of Ajllchin Flyover Project in Ulaanbaatar City (the Survey Team).

The Survey Team presented the result of road and bridge design, Construction Schedule, Utility Relocation, Land Acquisition, Project Cost, Project Effect and Project Implementation Schedule based on Draft Final Report. In addition, JICA introduced Special Terms for Economic Partnership (STEP) and recommended to apply it to the Project so that the Project can be implemented in the most economical manner.

Based on the above presentation and exchange of views among JCC members, it was mutually confirmed as stated Appendix-1 attached herewith. Based on this JCC meeting, JCC agreed that result of the survey should be promoted in Ministry of Economic and Development, and the Survey Team should prepare and submit Final Report in April 2013 reflecting the comments on the Draft Final Report to be presented by MRT not later than 15th March 2013.

Baasandorj. BATZAYA
State Secretary
Ministry of Roads and Transportation

Nyamdavaa GANTUMUR
Vice Mayor, Ulaanbaatar City

For ISOGAI Toshimori
Chief Representative
JICA Mongolia Office

岡崎 彰男

OKAZAKI Akio
Deputy Team Leader
JICA Survey Team

1. RESULT OF ROAD AND BRIDGE DESIGN

Bridge Type, Road Planning and Design Criteria stated in the Draft Final Report were confirmed by the Science and Technology Council in the MRT held on 17th December 2012. No specific comments on result of the design were stated during the JCC meeting.

2. CONSTRUCTION PLAN

Ulaanbaatar Railway and MRT expressed no objection on the construction methodology of bridge mentioned in the Draft Final Report including Window Time. Regarding Construction schedule, JCC members explained the importance to complete the Project by 2016 to coordinate with other projects such as BRT Project and MRT Project.

3. UTILITY RELOCATION PLAN

JCC member confirmed that Utility relocation should be implemented by UBC in accordance with the schedule mentioned in the Draft Final Report, and that relocation cost would be included in Preparation Cost to be excluded in principle from the Yen Loan.

4. LAND ACQUISITION PLAN

To prevent extra land acquisition and increasing of compensation, the Survey Team requested that 1) Cut-off Date should be immediately announced by UBC, 2) estimated R.O.W. should be informed to land possessor and 3) public notice should be made by means of message board at the Project site.

5. ENVIRONMENTAL IMPACT ASSESSMENT

It was confirmed that DEIA Report had been approved by the Ministry of Environment and Green Development in January 2013 and the Report would be disclosed on the Web site of the Ministry.

6. PROJECT COST

(1) The Study team explained that Land acquisition and compensation cost and Utility relocation cost were estimated and included in the Project Cost.

(2) The Survey Team explained that Price Escalation should consist of 9% per year in local portion and 2.1 % per year in foreign portion respectively, and that Physical contingency was estimated as 5% of construction cost and consultant fee.

(3) The Survey Team explained that the Construction Cost was estimated based on preliminary design which was result of comparison study to select optimal type of bridge. In response, JCC member remarked that further cost reduction would be strongly desired.

7. PROJECT IMPLEMENTATION SCHEDULE

Remarks were given by JCC members to the period which was estimated as more than two (2) years from procurement of consultant to commencement of the Construction in the Draft Final Report. Responding to the remarks, the Survey Team explained that the periods of detailed design, land acquisition, utility relocation and bidding were estimated based on required procedure and work volume.

However, JCC member strongly stated that D/D should be started in 2013 and Construction should be commenced in 2014.

8. SPECIAL TERMS FOR ECONOMIC PARTNERSHIP; STEP

JICA introduced advantage of Japanese ODA Loan namely "Special Terms for Economic Partnership (STEP)" in terms of interest rate, repayment period, grace period and Grant Assistance for the Detailed Design Work, and recommended to apply it to the Project so that the Project can be implemented in the most economical manner.

9. OTHERS

After the JCC Meeting, the Study Team, MRT and UBC held meeting respectively and agreed that MRT and/or UBC should deriver the comments on the Draft Final Report in writing to JICA Mongolia Office by March 15, 2013, which would be prepared by related agencies and to be well examined and arranged by JCC members.

Appendix-5

Record of Meeting for 1st Working Group Meeting

Preparatory Survey on the Construction of Ajilchin Flyover Project

In Ulaanbaatar City in Mongolia

1st Working Group Meeting

Minutes of Meeting

Date and Time : April 26th, 14:00-16:00
Venue : Meeting room B, 14th floor, Ulaanbaatar City Hall
Participants : See attached List of Attendees

1. **Opening remarks from Mr. B. Munkhbaatar, Deputy Mayor of UB City**
   Confirmation of WG members and explanation for progress of project was requested.
2. **Explanation for progress of project, project schedule and requests from Survey Team**
   Survey Team explained finished activities of the project, schedule, etc. The details are shown below:
   <Progress of project>
   1) Joint site observation (UB city, UB railway, consultant)
   2) Collecting information of UB city's Road plan
   3) Collecting information of Utilities
   4) Consideration of route of Ajilchin Flyover
   5) Confirmation of EIA procedure and GIA application
   6) Starting of Traffic survey (beginning from April 30th)
   7) Collecting the drawings of existing bridge in UB city (approx. 50 bridges)

   <Project schedule>
   1) Implementation of traffic survey and traffic demand forecasting
   2) Confirmation of route of Ajilchin Flyover
   3) Confirmation of project area
   4) Starting of DEIA
   5) Topographical survey, geological survey
   6) Bridge plan, road plan and intersection plan

   <Requests for UB city>
   1) Persuading traffic police and police stations to implement procedure for traffic survey
   2) Information provision of existing underground installed objects and utilities (hot-water supply line, electricity, telecommunication, water supply and sewerage system and railway)
   3) Persuading EIA procedure (GIA, DEIA)
   4) Discussion for confirmation of bridge design condition
   5) Discussion for technology transfer on bridge design and maintenance during project period
3. **About F/S of Ajilchin Flyover**

JICA Survey Team explained topics below, based on the presentation:

・Land use of project site and high-voltage line wiring plan (35kV)
・UB City road improvement plan 2012 (4-lane expansion of Narny Road, new construction of Dund River Bridge and 4-lane expansion of Dondgol Street)
・Alternative plan for route of Flyover (east-west route and north-south route)
・Draft plan of Narny Road intersection (grade separated or grade intersection)
・confirmation of project area (including or excluding Dund River Bridge improvement)

4. Survey on existing structure in UB City

Consultant reported the plan of survey on existing structure. The details are shown below:

(1) Existing bridge inventory survey
(2) Bridge soundness evaluation
(3) Developing bridge survey sheet
(3) Proposal of rehabilitation measures and retrofitting measures
(4) Proposal of supporting method of maintenance technology

5. Convening seminar on technology transfer

JICA Survey Team reported the seminar on technology transfer.

Draft date	:	Beginning of October (tentative)
Contents	:	Introducing Japanese technology of bridge construction, bridge maintenance , rehabilitation methods, etc.
Object person	:	20 persons (Engineer from UB City and Ministry of Road, Transport, Construction and Urban Development(MRTCUD))
Program	:	Further discussion will be implemented between Mongolian side to determine Program, period, participants, etc.

6. Question and answer

・Mr. Battogtokh, Deputy Director, Road Dept, UB City

- Road Department of UB City is conducting the project closely cooperation with JICA Survey Team and UB City Urban Development and Planning Department and Land Administration Department is supporting the project. Therefore the project is implemented following the original plan.
- Information of underground installed objects and utilities is provided by Mr. O. Odbayar and Mr. Erdenebayar, Urban Development and Planning Department, UB City.
- Land Management Department of UB City should provide the list of land owner.
- Mr. G. Khasbaatar, Road Department of UB City should persuade the procedure of General Impact Assessment (GIA), which related to Environmental Assessment.
- Mr. G. Khasbaatar, Road Department of UB City is in charge of asking cooperation about traffic survey implementation for traffic police, and it is already determined that nine police officer will provided during the survey. If the number of officer is short, Road Department can provide their own security guards.
- High-voltage line, of which capacity is 35kw, is highly possible to be an interrupt of this Flyover project, therefore the plan should be revised.

- JCC should be established as soon as possible. I will ask establishment to Mr.Gantmur, MRTCUD next week, when he will come back from his business trip.
- Expense burden of contractee for persuading EIA is needed to be issued Mandate by minister of MRTCUD. We should discuss it with Mr.Gantmur, Director of MRTCUD.
- Bridge design should be implemented after the route will be determined and it should take enough time. Technical transfer should reflect the opinions and requests from the other related organizations.

• **Mr. G. Khasbaatar, Road Department, UB City**

Traffic survey will start on April 29th. Traffic police of UB City is agreed to cooperate the survey implementation. To obtain the accurate answer during OD survey, UB City Traffic Control Center and police will cooperate to the survey. Ministry of Environment and Tourism will provide the result of GIA this afternoon.

• **Mr. O. Odbayar, Head of the Division, Construction & Urban Development Planning Department, UB City**

Our Department discussed with Survey Team and they provides us information of Ajilchin Flyover. We should discuss eight high-voltage lines with 35kw capacity with UB City Electric Cable Distribution Company. One of the interruptions along the railway, which mentioned during presentation, may be the brick barrier. We will provide the information of land owner. Members of project committee will be determined by next Monday or Tuesday and the related information will be provided from each Ministry and ready by the end of next week. We suppose to consider the bridge design conditions and construction conditions with Survey Team, after the line will be determined.

• **Mr. CH. Erdenedalai, Mongolian Railway Authority**

Mongolian Railway Authority and Ulaanbaatar Railway are always discussing and cooperating. There are many kinds of underground objectives, such as telecommunication cable and railway related objects, in proposed project area. We, Mongolian Railway Authority, recognize that the study should be implemented in cooperate with the Survey Team. We experienced Narny Bridge construction, therefore we can provide all the related information. Furthermore, we conducted existing bridge survey in 2003, we can also provide its result if the Survey Team needs it.

• **JICA Survey Team (Mr. Okazaki, Deputy Team Leader)**

I appreciate to the cooperation of all departments. Please note that to conduct the study rapidly, we sometimes need to discuss individually with WG members. In 2012, UB City road improvement plan listed 4-lane expansion of Narny Road, 4-lane expansion of Dondgol Street, and expanding construction of existing Dund River Bridge. We would like to confirm whether these projects will be implemented in this year. 4-lane expansion construction of Narny Road should be in harmony with the result of this Flyover project, as these two projects are related to each other.

• **Mr. Battogtokh, Deputy Director, Road Dept, UB City**

We are discussing the mentioned improvement construction in the Government, Mandate 106 is already issued to implement the construction using budget of Development Bank, according to plan. The budget for 4-lane expansion construction of Dondgol Street is not determined yet.

- **Mr. Maruoka, Urban Transportation System Improvement in UB City (JICA)**
  I heard that Master Plan of UB City will be discussed in Parlament. Ajilchin Flyover is included in UB City MP (2030). In this MP, Ajilchin Flyover is a part of major arterial road, which runs east-west direction. Construction of this Flyover is planned to implemented using ODA loan from Japan and the construction plan is need to be in harmony with MP.
- **Mr. Battogtokh, Deputy Director, Road Dept, UB City**
  Ajilchin Flyover is included in MP of 2020 and 2030. MRTCUD is also discussing its project.
- **Mr. O. Odbayar, Head of the Division, Construction & Urban Development Planning Department, UB City**
  MP sais only the basic things and I think the detailed plan should be determined through this project. It is an opportunity to construct new bridge, therefore I hope the Flyover connects to the Southern road (Dondgol Street). I request also that the consideration of measure to cross Dund River after the Flyover is landed.
- **JICA Survey Team (Mr. Okazaki, Deputy Team Leader)**
  The route of Flyover will be determined following the concept of MP and after enough discussion between Mongolian side. If there is no request, Survey Team will propose implementation date of next WG. As a draft schedule, next WG should be held before JCC, which have to hold in the end of May.

Period

List of Attendees

№	Name	Organization	Position
1	Mr. B.Munkhbaatar	UB City, Administration Dept.	Deputy Mayor of UB City
2	Mr.E.Enkhbat	MRTCUD	Specialist
3	Mr.Battogtokh	UB City, Road Dept.	Deputy director
4	Mr.G.Khasbaatar	UB City, Road Dept.	Project officer
5	Ms.M.Ichinkhorloo	UB City, Road Dept.	Bridge engineer
6	Ms.N.Hishgee	UB City, Public transport department	Financial planning division
7	Mr.KH.Bat-Erdene	UB City, Urban Development Policy Division	Traffic engineer
8	Mr.O.Odbayar	UB City, Construction & Urban Development Planning Dept.	Head of the Division
9	Mr.D.Nyamdavaa	UB City, Land Management Department	Land Registration for Bayangol District
10	Mr. M.Sergelen	UB City, Land Management Department	Land Registration for Khan-Uul District
11	Mr.S.Baatar	Water Distributing Authority	Engineer
12	Mr.CH.Erdenedalai	Mongolian Railway Authority	State Inspector
13	Mr.D.Tuvshinbayar	Ulaanbaatar Railway	Engineer
14	Mr.D.Ochir-Erdene	UB Traffic Control Center	Senior Engineer
15	Mr.T.Gantulga	Usnii Barilga Baiguulamj (Water Facilirty) Company	Engineer
16	Mr.B.Zolmandakh	UB Electric Distribution Network Company	Drawing Engineer
17	Mr. Bum-Erdene	Urban Transportation System Improvement in UB City (JICA)	Road Consultant
18	Mr.Kenji MARUOKA	Urban Transportation System Improvement in UB City (JICA)	JICA Expert
19	Mr.Akio OKAZAKI	JICA Survey Team	Deputy Team Leader
20	Mr.Kimio KANEKO	JICA Survey Team	Transport Planner
21	Mr.Hitoshi NAKAMURA	JICA Survey Team	Bridge Engineer
22	Ms.Misa OISHI	JICA Survey Team	Social Impact Consideration
23	Mr.Mitsuhiro OYAMA	JICA Survey Team	Utility Survey&Construction Planner
24	Mr.Takayoshi KITAMURA	JICA Survey Team	Bridge Inspection
25	Mr.Toshiyuki SATO	JICA Survey Team	Bridge Design Assistant / Coordinator
26	Mr.N.Tserendorj	JICA Survey Team	Interpreter
27	Mr.O.Bold	JICA Survey Team	Interpreter

Appendix-6

Record of Meeting for 2nd Working Group Meeting

Preparatory Survey on the Construction of Ajilchin Flyover Project

In Ulaanbaatar City in Mongolia

2nd Working Group Meeting

Minutes of Meeting

Date and Time : May 30th, 14:00-16:15
Venue : Meeting room B, 14th floor, Ulaanbaatar City Hall
Participants : See attached List of Attendees

1. **Explanation for cost, effect and affected area of each alternative construction plan from Survey Team**
   The explanation was implemented to determine the route of Flyover and project area.
2. **Result of question and answer**

・**JICA Study Team**
- UB City demands to adopt north-south plan, although they understand east-west plan is the first option. Considering the compromise plan, connection point to Dondgol Street along north-south route is near to crossing of railway branch line. Consultant found out that number of accidents in/around crossing is some per year. There is afraid of traffic safety.
- Initial cost estimation which written in handout excludes fee for consultant service, land acquisition, resettlement compensation, etc.
- Number of lanes (width) of Flyover is determined after the route selection, traffic volume survey and consideration of structure.

・**Mr. Davaansuren, Road Department, UB City**
About route selection, Ajilchin Flyover is planned to take a role of the east-west direction traffic, meanwhile Narny Bridgeis expected to take a role of the north-south direction flyover.

・**Traffic Police, UB City**
However, please consider the north-south route as a compromise plan from the viewpoint of traffic network.

・**JICA Survey Team**
- Initial cost estimation is trial calculation at this moment and using Japanese standards such as unit cost for calculation (same as Narny Bridge). This is promised on Ajilchin Flyover project is implemented adopting ODA loan form Japan. After the route is determined, more detailed estimation will be conducted.
- There is high-voltage line project which is supported by WB. The construction under this project is already started and the changing is difficult. Consultant surveyed the construction site of steel tower and implement road alignment planning to avoid the steel tower.

・**Land Registration for Bayangol District, Land Management Department**

We experienced a problem of land acquisition around proposed area of Ajilchin Flyover, therefore the east-west route is appropriate. Complex plan is difficult to adopt because the land acquisition and resettlement for ramp construction. The east-west route should be adopted to minimize compensation and resettlement.

- **JICA Survey Team**
  - Indicate of socio-economical effect of this project is evaluated after route selection, structural consideration, and traffic volume forecast. The route is not determined at this time, therefore route selection is needed to be finished first. After that, economical evaluation, such as EIRR, will be conducted. EIRR is consisted of construction cost estimation and economical benefit estimation. The complex plan requires the high construction cost in spite of forecasted traffic volume is not huge, therefore the result of EIRR will be low.
  - The traffic volume which shown in handout is the result of survey conducted in 2012. Car OD survey is newly implemented and the more accurate analysis has been implementing.
- **JICA**
  - This project itself is not directly reflected to ODA loan project. We will consider the scale and contents of project and after that whether Mongolian side will pay or implementation using ODA loan will be considered. Through this meeting, we understand that Mongolian side requests north-south route, but we conclude that the east-west route is the first option, based on the result of past meetings.
  - Firstly the survey for the east-west route should conducted and implementation of the survey for the north-south route, which Mongolian side is strongly requested, is needed to reconsider in JICA. This opinion should be bring to JCC as result of today's WG and approved in JCC.

Period

List of Attendees

№	Name	Organization	Position
1	Mr.L. Tserendamba	UB Electric Cable Distribution Co.	Project Division
2	Mr. B. Erdenebat	UB Electric Cable Distribution Co.	Design Division
3	Ms.M.Ichinkhorloo	UB City, Road Dept.	Bridge engineer
4	Mr.G.Hasbaatar	UB City, Road Dept.	Specialist
5	Mr. L. Dungarmaa	Usnii Barilga Baiguulamj (Water Facilirty) Company	Engineer
6	Mr. YU. Davaansuren	UB City, Road Dept.	Head of Division
7	Mr.D.Ochir-Erdene	UB Traffic Control Center	Senior Engineer
8	Mr.D. Chinzorig	Ulaanbaatar Railway Authority, Technical Policy and Design Division	Engineer
9	Mr. T. Narmandakh	ICT Network Co.	Engineer
10	Mr. Nyambayar	UB City, Construction & Urban Development Planning Dept.	Construction Engineer
11	Mr. M.Sergelen	UB City, Land Management Department	Engineer
12	Mr.D.Nyamdavaa	UB City, Land Management Department	Land Registration for Bayangol District
13	Mr. Batjargal	Road Police	Senior investigator
14	Mr. L. Altangerel	UB City, Administration Dept., Facility Division	Head of Division
15	Mr. TOMIHARA	JICA Mongolia	Assistant Director
16	Mr. Tsunemi NAGATA	JICA Survey Team	Team Leader
17	Mr.Kimio KANEKO	JICA Survey Team	Transport Planner
18	Mr.Hitoshi NAKAMURA	JICA Survey Team	Bridge Engineer
19	Mr. Mitsuhiro OYAMA	JICA Survey Team	Utility Survey & Construction Planner
20	Mr. OGAWA	JICA Survey Team	
21	Mr. Masatoshi WATANABE	JICA Survey Team	
22	Mr. GOTANDA	JICA Survey Team	
23	Ms. Misa OISHI	JICA Survey Team	Social Impact Consideration
24	Mr. Takayoshi KITAMURA	JICA Survey Team	Bridge Inspection

Appendix-7

Record of Meeting for 3rd Working Group Meeting

Preparatory Survey on the Construction of Ajilchin Flyover Project

In Ulaanbaatar City in Mongolia

3rd Working Group Meeting

Minutes of Meeting

Date and Time : October 19th, 14:00-16:15
Venue : Meeting room B, 14th floor, Ulaanbaatar City Hall
Participants : See attached List of Attendees

1. **Opening remarks from Mr. N. Gantumur, Deputy Mayor of UB City**
2. **Massage from Mr. Nagata, Team Leader, JICA Survey Team**
3. **Explanation of Interim Report from Mr. Okazaki, Deputy Team Leader, JICA Survey Team**
   - Project activities which already finished and related information
   - Flyover route and project area determined in 1st JCC
   - Necessity of Ajilchin Flyover
   - Outline of Construction project
   - Road plan (plan of West Industrial Road part, grade separated intersection of Narny Road, land acquisition problem, design condition)
   - Bridge plan (pier position, bridge type, basement type, design condition)
   - Adoption of Japanese technology
   - Relocation of utility
4. **Comment**

・**Mr. N. Gantumur, Deputy Mayor of UB City**

- This project is supposed to implement using ODA loan. I heard that the construction cost is expensive, but project implementation is approved byMinistry of Economy and Development, after confirming the condition of ODA loan.
- Many railway facilities are needed to relocate to implement Ajilchin Flyover project. There is a plan to construct new railway station, therefore adequate discussion for land acquisition is very important.
- The plan which East-West Arterial Road runs until Ajilchin Street is based on the result of detailed survey, so that this is the necessary project. While the construction cost is expensive, I understand that the quality is very sufficient like Narny Road.
- It is important to implement under UB City Urban Development Master Plan and other planning project.
- UB City is now processing the 14 kinds of simplified approving procedure. Survey term is taken enough, now I hope the survey accomplish as soon as possible. I understand that Japanese government and Mongolian government will discuss to implementation of construction until the deadline of final report submission, next March.

5. Question and answer

- **Mr. D. Nanzaddorj, Director, Road Department, UB City**

  Please ask your question. Please ask after grabbing the description in Interim Report to avoid any problem to make Final Report.

- **Mr. SH. Erdenebulgan, Head of Center, UB Railway Technological Policy Design Center**

  - There are many facilities which will be affected in the project area of Ahilchin Flyover. We already submitted the official letter to Road Department and Land Management Department of UB City to extend UB Railway. Please proceed land acquisition and determination of detailed compensation based on the letter.
  - Bridge pier, construction yard and window time in the area of railway should be discussed based on the drawings, because the position of P7, P8 and P9 locate inside the land of National Railway.
  - Window time of railway is 4 hour per day at maximum. Window time in the area of branch lines and incoming lines is more than 4 hour, but it have to be discussed to answer. I would like to have individual discussion.

- **Mr. Nagata, Team Leader, JICA Survey Team**

  According to Deputy Mayor, new railway station is going to constructed around the project area. Please inform us the specific location and day of starting construction.

- **Mr. SH. Erdenebulgan, Head of Center, UB Railway Technological Policy Design Center**

  The day of starting construction is not determined, however the location is western side of existing station, where now the second-hand car shop is located.

- **Mr. D. Bat-undrakh, Land Acquisition Division, Land Management Department, UB City**

  There are many structures and facilities related to UB Railway, which are affected from this project, however, I think the problem of compensation can be solved with adequate estimation of asset price and discussing, same as construction of Narny Road.

- **Ms.T. Battsetsteg, Electricity Department, UB City**

  We have been discussing JICA Survey Team form the beginning of this project. We think there is no big problem. There are 2 electricity cables which are needed to relocate, but it is possible to estimate relocation cost, after confirming construction work information.

- **Ms. T. Narmandakh, Telecommunication Engineer, Information and Telecommunication Network Department**

  There are underground objectives, 10 telecommunication cables, under Dungol Bridge and Narny Road. These can be relocated and shown in maps after checking design drawings.

- **Mr. Okazaki, Deputy Team Leader, JICA Survey Team**

  All the drawings of this project are attached to Interim Report. We can also provide CAD data. To calculate the relocation cost, we would like to ask individual discussion. Please arrange meetings in Road Department of UB City between absent members who in charge of utilities.

- **Mr. D. Nanzaddorj, Director, Road Department, UB City**

  - Please attend observation and confirm carefully the information of utilities and underground objects of UB Railway.
  - UB City will in charge of implementation of utility relocation.
  - I understand the plan of road and bridge and design conditions are acceptable to agree.

- Please discuss well with each Department and person who in charge of utility relocation, especially UB Railway. Many of their facilities need to relocate please estimate the asset price carefully not to occur any problem during construction.

Period

List of Attendees

№	Name	Organization	Position
1	Mr. N. Gantumur	UB City, Administration Dept.	Deputy Mayor of UB City
2	Mr. D. Nanzaddorj	UB City, Road Dept.	Director
3	Mr. G. Khasbaatar	UB City, Road Dept.	Project officer
4	Mr. L. Erdenebat	UB City	Senior officer
5	Mr. O. Odbayar	UB City, Construction & Urban Development Planning Dept.	Head of the Division
6	Mr. L. Ganbat	UB City, Design Division, Construction & Urban Development Planning Dept.	Director
7	Mr.D.Bat-undrakh	UB City, Land Management Dept., Land Acquisition Division	Head of the Division
8	Mr.KH. Unurjargal	UB City, Traffic Control Center	Traffic Engineer
9	Mr. T. Battsetseg	UB City, Electricity Dept.	Director
10	Mr. SH. Erdenebulgan	UB Railway Technological Policy Design Center	Head of Center
11	Mr.T. Narmandakh	Telecommunication Engineer, Information and Telecommunication Network Department	Telecommunication Engineer
12	Ms. A. Bulgan	JICA	Program Officer
13	Mr.Kenji MARUOKA	Urban Transportation System Improvement in UB City (JICA)	JICA Expert
14	Mr. Tsunemi NAGATA	JICA Survey Team	Team Leader/Bridge Plan
15	Mr.Akio OKAZAKI	JICA Survey Team	Deputy Team Leader/Bridge Design(1)

Appendix-8

Record of Meeting for 4th Working Group Meeting

Preparatory Survey on the Construction of Ajilchin Flyover Project

In Ulaanbaatar City in Mongolia

4th Working Group Meeting

Minutes of Meeting

Date and Time : February 27th, 2013, 10:00-
Venue : Meeting room, 14th floor, Ulaanbaatar City Hall
Participants : See attached List of Attendees

1. **Opening remarks from Mr. N. Gantumur, Deputy Mayor of UB City**
2. **Confirmation of Draft Final Report of Preparatory Survey on the Construction of Ajilchin Flyover Project in Ulaanbaatar City in Mongolia**
3. **Question and answer**

・**Mr. Nanzaddorj, Director, Road Dept, UB City**
We are going to hold two meetings successively, WG and JCC. Please express your opinion.

・**Mr. Okazaki, Deputy Team Leader, JICA Survey Team**
Mr. Murayama from JICA Headquarter joins today's meeting. Please express your honest opinion.

・**Mr. Gantumur, Deputy Mayer, UB City**
JCC is going to hold after WG, please make comments.

・**Mr. Okazaki, Deputy Team Leader, JICA Survey Team**
(Explanation of Draft Final Report)

・**Mr. Gantumur, Deputy Mayer, UB City**
Ministry of Economy and Development of Mongolia worries two things to construct the Flyover. One is the long period of construction, and another is expensive cost. Mongolian side hope to complete the construction as soon as possible. This project is related to BRT project and Metro project of ADB.

・**Mr. Erdenedalai, Specialist, Department of Road Transport and Registration, MRT**
I think cost and construction period are adequate. Railway Department will cooperate to the project. We experienced Narny Bridge. About construction period, some days of April and October are also available for construction. Please consider it.

・**Mr. Bayarbaatar, Director, Strategic Policy and Planning Department, UB City**
Construction cost of Narny Bridge seems to be deceased 20% due to the difference of currency exchange rate. I heard that price of steel is decreased 10%, is it because of the exchange rate?

・**Mr. Okazaki, Deputy Team Leader, JICA Survey Team**
Steel price and currency exchange rate are not strongly related. Yen has been strong for long, but yen is becoming weak.

・**Mr. Nanzaddorj, Director, Road Dept, UB City**

What is included in contingency cost and preparation cost? As a comment, I think completion in 2019 is late. DD should start in 2013, construction work starts 2014 and completion in 2017. Completion in 2019 causes that relation between BRT project and metro project is not work well.

- **Mr. Okazaki, Deputy Team Leader, JICA Survey Team**
  Contingency cost includes price escalation cost (9.0% per year in domestic currency and 2.1% per year in foreign currency) and 5% of physical contingency cost as construction cost and consultant fee. We considered construct steel bridge and cost and period is most adequate.
- **Mr. Bayar-Ulzii, Director, Engineering Facilities Department, UB City**
  3.6BLN MNT is secured for relocation of underground objectives. Is it right that UB City pay this cost and ODA loan will not cover?
- **JICA Survey Team**
  Utilitiy relocation cost is not included in ODA loan usually.
- **Mr. T. Bat-Erdene, Head of Department, UB Railway**
  In case of Narny Bridge, relocation cost was needed which was not predetermined. I hope this will not occur in Flyover project.
- **Mr. Gantumur, Deputy Mayer, UB City**
  UB City will cover the relocation cost of railway facilities. I would like to finish WG meeting and go on to JCC.

Period

List of Attendees

№	Name	Organization	Position
1	Mr. N. Gantumur	UB City, Administration Dept.	Deputy Mayor of UB City
2	Mr. G. Hasbaatar	UB City, Road Dept.	Foreign relation
3	Mr.Artur	MRT, Railway Policy Implementation and Coordination Division	Director
4	Mr. CH. Erdenedalai	MRT	Specialist
5	Mr. T. Bat-Erdene	UB Railway	Head of Dept.
6	Mr. Bayarbaatar	UB City, Strategic Policy and Planning Dept.	Director
7	Mr. D. Nanzaddorj	UB City, Road Dept.	Director
8	Mr.O.Odbayar	General Planning Agency, Construction & Urban Development Planning Dept.	Head of the Dept.
9	Mr. L. Ganbat	UB City	Head of Dept.
10	Mr. Bayar	UB City, Property Relation Dept.	Head of Dept.
11	Mr. D. Bat-Undrakh	UB City, Land Management Dept.	Head of Dept.
12	Mr. S. Bayar-Ulzii	UB City, Engineering Facilities Dept.	Director
13	Mr. L. Erdenebat	UB City, Engineering Facilities Dept.	Senior Specialist
14	Mr. D. Ochir-Erdene	UB Traffic Control Center	Head of Task
15	Mr. D. Chinzorig	UB Railway	Engineer
16	Mr. Naranhishigt	UB Heating Network Maintenance and relocation	Engineer
17	Mr. T. Narmandakh	NETCOM Co.	Engineer
18	Mr. TS. Bayarmaa	Water Facility	General Engineer
19	Mrs. L. Dungarmaa	USUG	Engineer
20	Mr. Mitsuo MARUYAMA	JICA	Country Officer
21	Mr. Yutaka WAKISAKA	JICA	Representative
22	Mr. Tsunemi NAGATA	JICA Survey Team	Team Leader
23	Mr.Akio OKAZAKI	JICA Survey Team	Deputy Team Leader

Appendix-9

Detailed Environmental Impact Assessment Report

Батлав:
БОАЖЯ-ны ерөнхий шинжээч Д. Энхбат

Шүүмж хийсэн:
БОАЖЯ-ны шинжээч С. Баярцэцэг

ENVIRON

АЖИЛЧИН ГҮҮРЭН ГАРЦ ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

Нарийвчилсан үнэлгээ хийсэн
Мэргэжлийн байгууллага:
"Энвайрон" ХХК-ийн захирал Н. Эрдэнэсайхан

Төсөл хэрэгжүүлэгч:
Нийслэлийн засаг даргын
хэрэгжүүлэгч агентлаг
Авто замын газрын дарга Д. Нанзаддорж

Төсөл хэрэгжих нутаг:
Баянгол дүүргийн
Засаг дарга Л. Амгалан

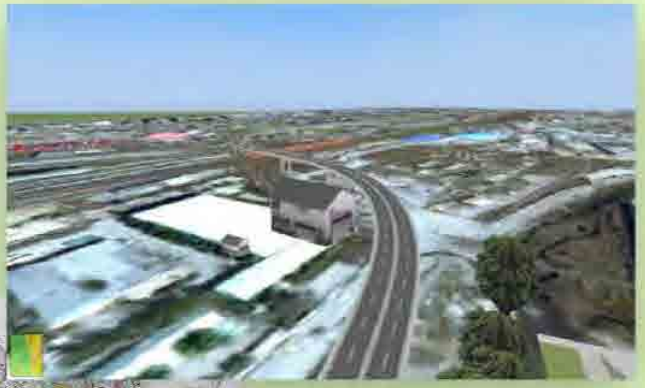
Улаанбаатар хот
2012 он

ENVIRONMENTAL IMPACT ASSESSMENT COMPANY
ENVIRON LLC

"AJILCHIN FLYOVER PROJECT"

DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

REPORT



ULAANBAATAR CITY 2012

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1. INTRODUCTION

1.1 Project background

1.1.1 Project demands

The railway through the center of Ulaanbaatar city divided the city into the north and south sections and traffic movement which was passed above the railway, is restricted by the 3 bridges namely “Peace Bridge”, “Narny Bridge” and “Gurvaljin Bridge”. “Narny Bridge” constructed at the 3km from “Girvaljin Bridge” by Japanese Grant Aid Project, has been opened to traffic since October 2012. It is expected that the Narny Bridge will reduce traffic movement intensities but it is not enough to regulate expected movement intensities.

The “Ajilchin” flyover which is being planned by the project will be located in the middle of Narny Bridge and Gurvaljin Bridge and will improve auto road networks of the city, simultaneously will be advantageous to disperse and allocate movement intensities of the “Gurvaljin” and “Narnii” bridges. Moreover, as a result that “Ajilchin” flyover is built, will solve main magisterial auto road trace parallel to the Peace avenue which was reflected to the General Plan of Ulaanbaatar city until 2030; movement load of the Peace avenue will be reduced and also auto road network to the right and east sides will be improved.

1.1.2 Project location

Ajilchin flyover project is planned to be constructed in the territories of the 4th khoroo of Bayangol district and 3rd khoroo of Khan-Uul district, which stretches from right end of Narny zam road to the south passing above the railway lines and continues along the Baruun Teeverchdiin street and ends at the intersection of “Ajilchin” street.

1.1.3 Key project components

Project will consist of following components.

- To construct flyover bridge
- To construct approach road to the flyover bridge.

1.1.4 Project Scope

Project team must define following project scopes according to preliminary research.

(1) Start and ending point of the project

Start point: Ajilchin street and crossing of west coast of Dundgol

End point: Central depot of Ulaanbaatar Railway

(2) Flyover boundaries

It is connected from Narnii zam to the east road of Dundgol.

(3) Road connection boundaries

North: Extension Plan for restructuring “Narnii zam” with 4 rows will be implemented within this year and reflected that “Ajilchin” flyover will be connected to Narnii zam after it was extended with 4 rows.

South: West side from branch railway to TPP-3. (Crossing of Ajilchin street)

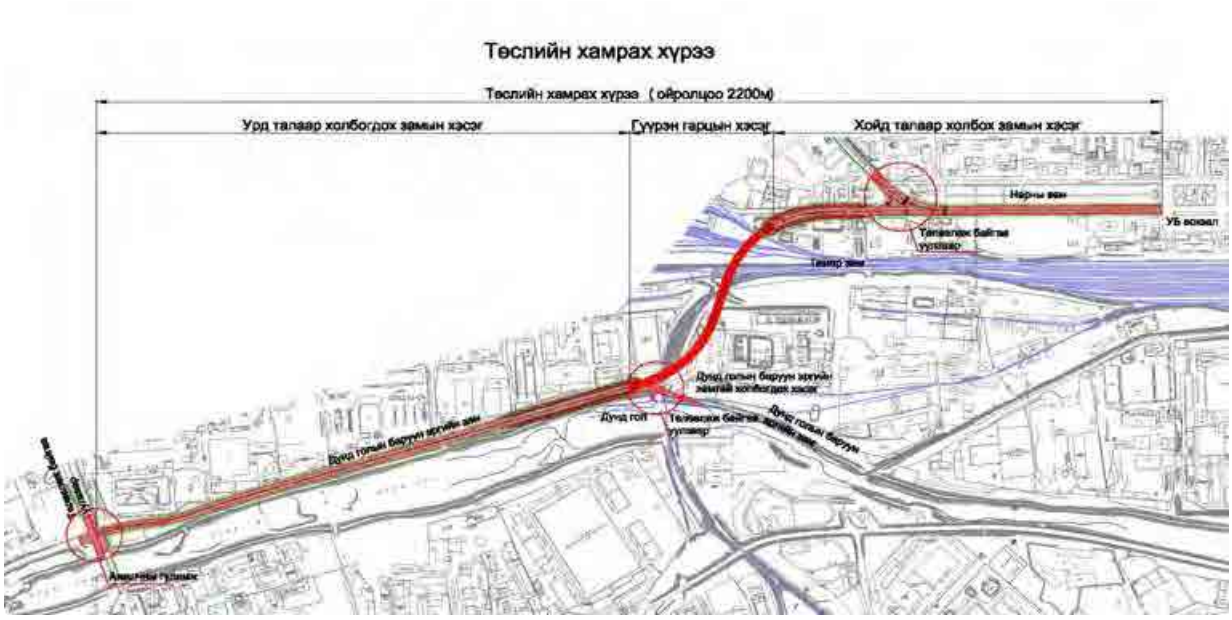


Figure 1. Scope of the Project

1.1.5 Project funding

Feasibility Study for the Project has been carried out since March 2012 and been scheduled to complete by February 2013. Funding for the Project Implementation would be discussed based on result of the F/S.

1.1.6 General Environmental Impact Assessment

According to the Environmental Impact Assessment Law of Mongolia, any project prior its implementation, should be submitted to the Ministry of Environment and Green Development (MEGD) of Mongolia for a General Environmental Examination. As implementing agency, UB Road department has submitted the Ajilchin Flyover Project Proposal to MEGD and in turn the Ministry has issued a Conclusion of General Environmental Examination on 25th of April 2012 recommending to conduct detailed environmental impact assessment (a copy of MEGD’s conclusion letter is attached in the annex 1).

The present report is as a follow up of above conclusion of the Ministry.

1.2 Environmental Policy, Legal and Institutional Framework

1.2.1 Government Environmental Policy, Regulations and Guidelines

Mongolia has a comprehensive legal framework on Environment. This includes policies, laws and strategies which focused to ensure healthy and safe living environment for Mongolian citizens, to fulfill international obligations and conservation of ecologically sensitive areas. A list of laws, plans and programs pertinent to the project are included in table 1.

Table 1. Main laws and regulations relevant to Flyover project

Classification	Names	Year
General	Law on environmental protection	Revised in 1995／2005, 2008
EAA	Law on Environmental Impact Assessment	Revised in 1998／2001
Pollution control	Law on Air	Validated in 1995／2010
	Law on Air Pollution Payment	2010
	Law on Water	Revised in 1995／2004
	Law on Hazardous and Toxic Chemicals	2006
	Law on Labor Safety and Hygiene	2008
	Law on State Professional Inspections	2003
Environmental standard	Air and Noise MNS4585:2007）	2007
	Water MNS4586: 1998）	1998
	Soil（MNS5850: 2008）	2008

Requirements for Environmental Impact Assessment are regulated by the Law on Environmental Impact Assessment (it was approved in 1998 and revised in 2002 and 2012 respectively). Scope of the law includes screening of new projects and or projects for extensions of current manufacturing and service buildings and explorations of natural resources. Purpose of the law is to protect environment, to prevent ecological degradation, to regulate exploitation of natural resources, to assess environmental Impact assessment and to regulate decision making process about implementations.

1.2.2 JICA Guideline

(1) JICA Safeguard Policy

Japan International Cooperation Agency (JICA) considers environmental and social considerations as environmental impacts on air, water, soil, ecosystem, fauna and flora as well as social impacts including involuntary resettlement and respect for human rights of indigenous people and so on. Environmental Impact Assessment by JICA means evaluating environmental and social impacts that projects are likely to have, analyzing alternative plans and preparing adequate mitigation measures and monitoring plans in accordance with laws or guidelines of the recipient governments.

While project proponents etc. bear the ultimate responsibility for the environmental and social considerations of projects, JICA supports and examines appropriate environmental and social considerations undertaken by project proponents to avoid or minimize development projects' impacts on the environment and local communities, and to prevent the occurrence of unacceptable adverse impacts. JICA thus promotes sustainable development in developing countries. In these guidelines, JICA has created clear requirements regarding environmental and social considerations, which project proponents must meet. JICA provides project proponents with support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. JICA examines undertakings by project proponents in accordance with the requirements, and makes adequate decisions regarding environmental and social considerations on the basis of examination results.

(2) JICA's Guideline for Environmental conservation and Social Considerations

At the Official Development Assistance Charter (ODA Charter) of Japanese Government reflected that "Japan complies with fairness while it processes and implements the assistance policy. In order to do that, Japan aims to support vulnerable part of the society of developing countries and to remove discrimination of regional development and distinction between rich and poor people". Also it was reflected that "Pays special attentions to environmental and social Impacts to implement Official development Assistance".

The JICA organization is an implementer of the ODA and plays main role to create sustainable development in the developing countries.

2. DESCRIPTION OF THE PROJECT

2.1 Project Location and Setting

Ajilchin flyover project is planned to be constructed in the territories of the 4th khoroo of Bayangol district and 3rd khoroo of Khan-Uul district, and which stretches from right end of Narny zam road to the south passing above the railway lines and continues along the Baruun Teeverchdiin street and ends at the intersection of “Ajilchin” street.

Flyover bridge length above the railway is planned to be 600 meter in length and access road to the flyover bridge will be 2200 m.

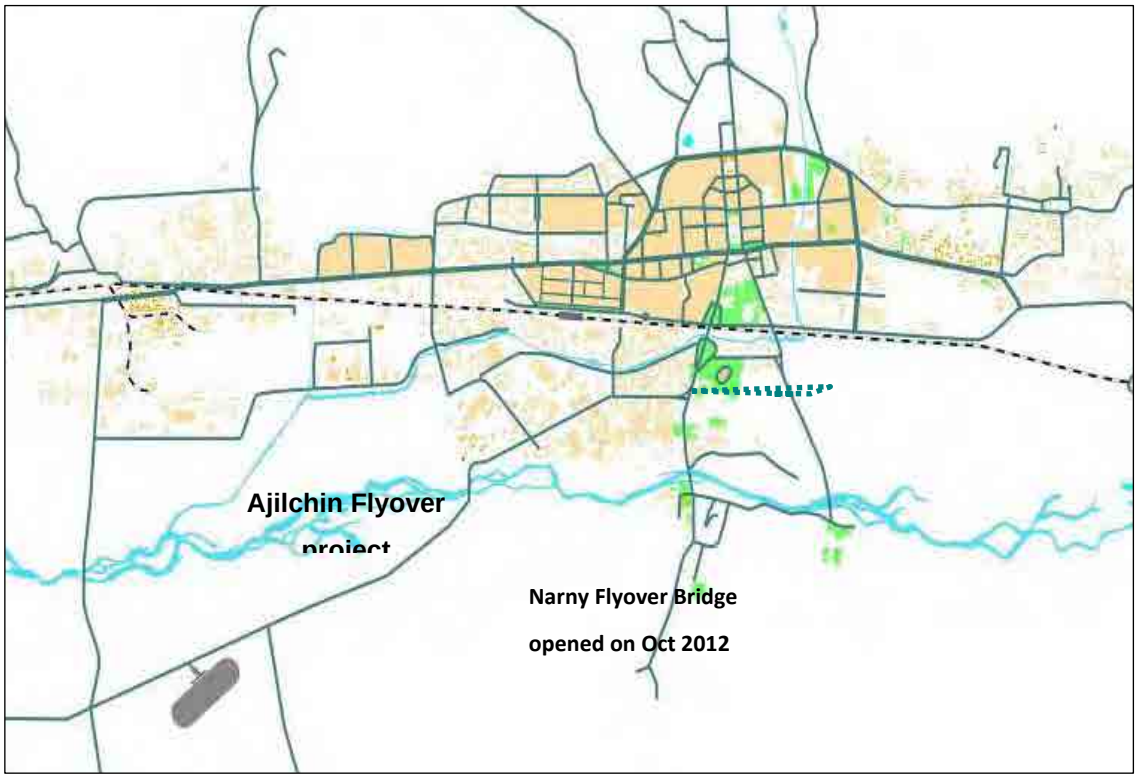


Figure 2. Location of Ajilchin Flyover project in Ulaanbaatar Road Scheme

2.2 Project Design Details

JICA feasibility study team, which aim was to design the flyover project, has made extensive surveys on current traffic volume and future traffic trends based on the socio-economic development of Ulaanbaatar city, demographic statistics, and other associated problems that challenge the city. While at the design stage of Flyover project, two basic alternative routes: “East-West” and “North-South” have been analyzed within the feasibility study framework.

Moreover, three alternatives within each of these two alternatives have been analyzed in terms of traffic volume, road safety and overall construction costs etc.

2.2.1 “Ajilchin” flyover

The feasibility study team has conducted surveys focused to select the best route that meets the current and future traffic demands of Ulaanbaatar city. As a result, the most suitable route within three “East-West” alternatives was chosen as the best route in terms of traffic safety, feasibility and impacts to environment and local development.

The chosen East-West route is shown in figure 3.

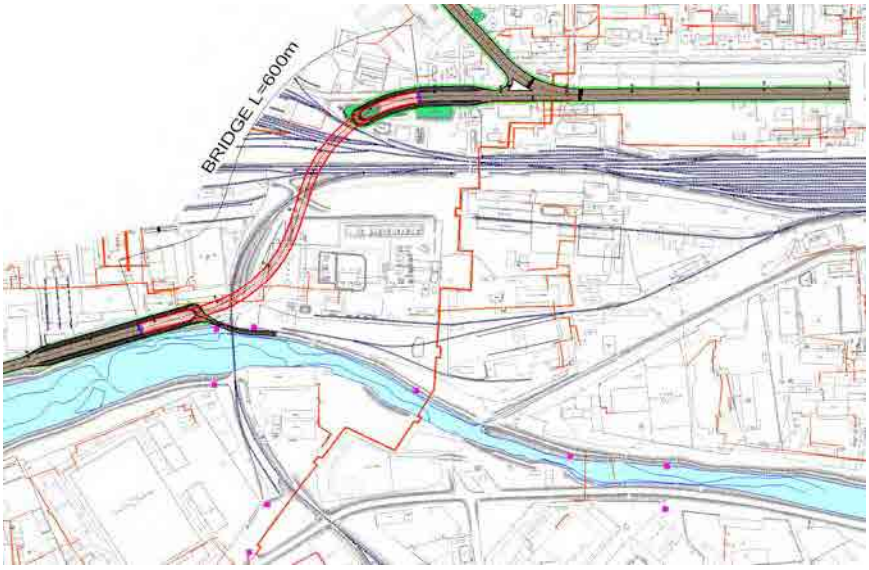


Figure 3. Most feasible East-West route

As described in figure 4, road traffic width will be 17 m in total and with 7 m wide lane in each way. Road gradient is designed to be 4%, which ensures road safety.

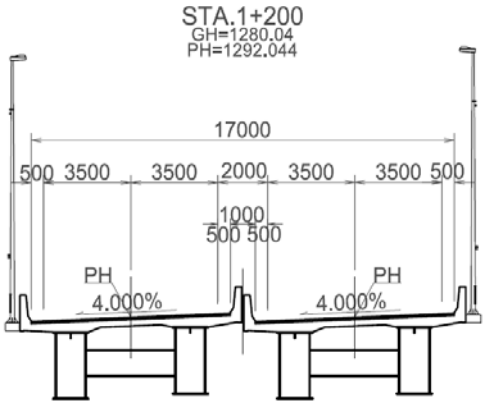


Figure 4 Bridge Section

Cross-sections of Flyover bridge and ON-OFF Ramp are shown in figure 5.

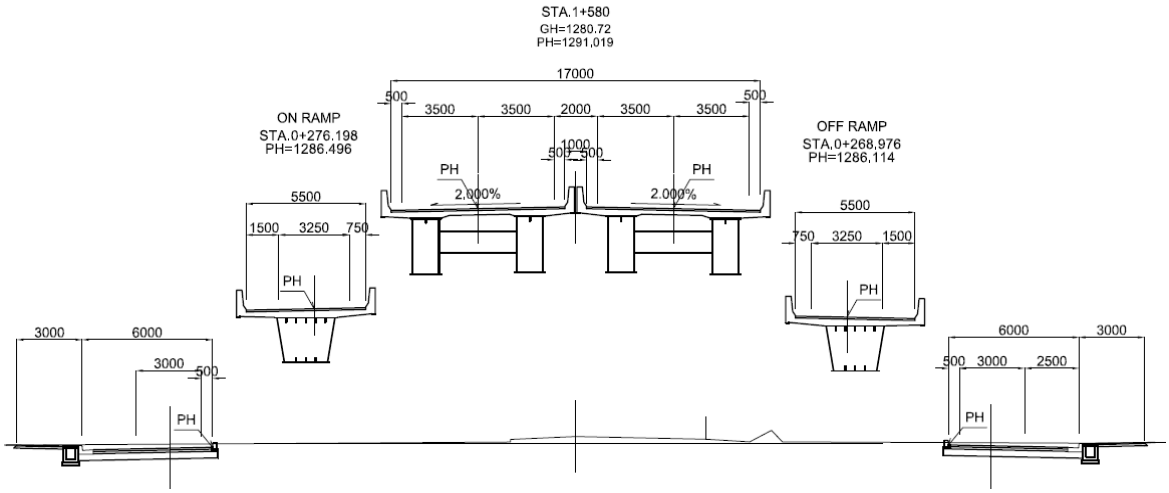


Figure 5 Bridge and ON-OFF Ramp Section

In the design of flyover bridge and access roads, Mongolian Standard (BNbD-32-01-04), Japanese Standard, and US Standard have been considered to establish a suitable design. Standards and Normatives that have been used in the Flyover and access road design are described in table 2.

Table 2. Standards and normatives applied for Road Design

Items		Used standards for project		Remark
Road standard		Mongolia BNbD		
Cross structure	Road width	3.5 m		
	Insulation line	5.0 , 0.0		
	edge	1.0 m /bridge 0.5 m/		
Calculation rate		60 km/hr		
minimum rotation radius		200 m		Appropriate
Maximum bias		6%		
Rotation radius and bias		6%	270 ≤ R < 330	Complied with Japanese standards for safety
		5%	330 ≤ R < 420	
		4%	420 ≤ R < 560	
		3%	560 ≤ R < 800	
		2%	800 ≤ R < 2000	
Vertical curve radius		2000 /standard bias 2%/		
Rotation radius and road extension width		R = 160 0.0m		
Length of minimum rotation radius on even surface		100 / Θ<7^0 : 700/Θ /		
Drifting curve		Radius length	50	
		Minimum parameter	90	
		Reducible radius	500	
Maximum longitudinal bias		4.5%		Estimated sliding
Longitudinal rotation		Convex	1400 /appropriate 2000/	
		Lap	1000 /appropriate 1500/	
Combined bias		≤ 8% / In snowy and cold area/		

2.2.2 Access roads

As mentioned in the project design section, total length of Flyover project including its access roads from both sides will be 2200 m (Figure 6). Narny road, one of busy roads of UB will approach the Ajilchin flyover project from the north side and its length is planned about 600 meters. Cross-section of Narny access road is shown in figure 7. On the west, access road will be West industrial road with four lanes along the Dundgol River with length of 1,000 meters. Typical cross-section of West industrial access road is shown on figure 6, below.

Figure 6 Access road to Ajilchin Flyover Bridge

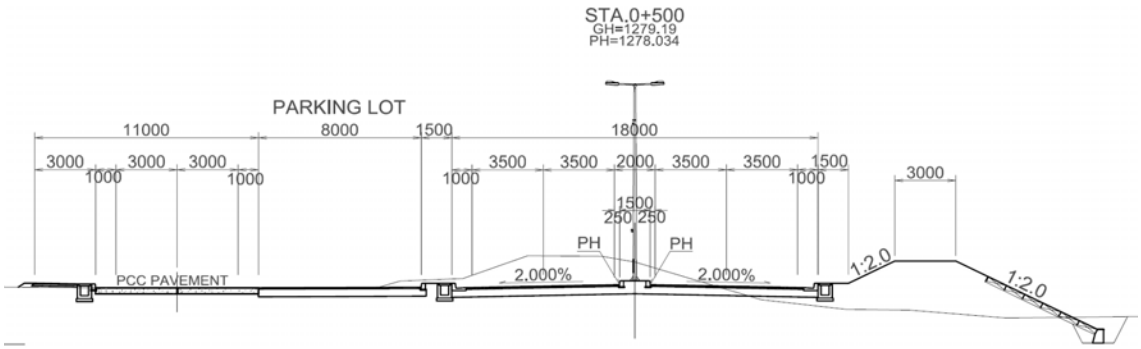


Figure 7 Cross-section at West Industry Road

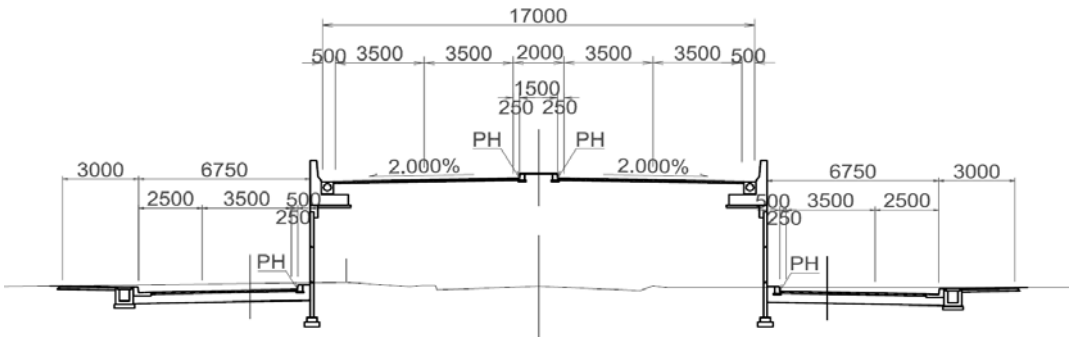


Figure 8 Cross-section at Narny zam Approach Road

2.3 Implementation stages

The project is planned to be implemented by following schedule.

The first stage: Feasibility Study is implemented from March 2012 to February 2013.

The second stage: Approval of the Project in Mongolian Parliament has to be done. Loan Agreement shall be concluded between Mongolian Government and the Japanese Government in case Japanese Yen Loan would be applied.

The third stage: Detailed Engineering Design and Preparation of Bid Documents will be conducted for twelve (12) months after selection of consultant according to loan agreement.

The fourth stage: Bidding and selection of the Contractor would be carried out within six months.

The fifth stage: Construction work would be implemented for 4 years.

3. ENVIRONMENTAL BASELINE DATA

3.1 Physical and geographical resources

3.1.1 Geography

The capital city Ulaanbaatar is surrounded by the mountains Bayanzurkh, Bogd Khan, Songino Khairkhan to the east, south, west and north. These mountains are the southern edges of Khentii Mountain and located in the confluence valley of the rivers Tuul and Selbe.

Ulaanbaatar lies an average of 1351 m above sea level and has in total of 4,704.4 square kilometers of territory. The city is stretched out 5 km from north to south and 30 km from east to west.

The Strictly Protected Area of Bogd Mountain is located to the south of Ulaanbaatar. The Tuul River runs from east to west across the mountainside and mountains and hills that continue to the north of city.

The Selbe River (the downstream of this river is so-called Dundgol River) flows into the Tuul River at the front mountainside. Bogd Khan Mountain is the mountain that stretches approximately 40 km from east to west. In the center it has the characteristics of high and medium mountains, its peak, Tsetsee Gun mountain top is of 2268 m high. Bogd Khan Mountain and its nearby area are located in the south western area of Khentii, part of Khangai Khentii frowning mountain ranges.

Sediments accumulated during the carbon age (350-200 million years ago), granite generated during the Jurassic and Cretaceous period of the Mesozoic era and modern moraine are spread in mountainsides and ravines.

The 1854 m high Tsogtchandmani Mountain located in the south western edge of the Khentii Mountain lying in the south east (south east from Nalaikh) of Ulaanbaatar is an internal watershed of basins of the Arctic Ocean, Pacific Ocean and Central Asia without outer flow.

The area that belongs to this project is sedimentary which is the steppe and low ground.

3.1.2 Soil

The soil cover of Ulaanbaatar consists from mountain- meadow steppe soil, mountain forest soil, and mountain steppe soil, soil of humid origin and river plain soil.

The four types of soil in terms of mechanic composition; muddy sand with gravel, sandy and muddy gravel, gravel with sand and clay and split soil are distributed in the most of project implementation area for the overhead bridge (overhead crossing) at Ajilchni street.

Paved soil with a thickness of 1.0-2.2 m and various compounds originated from human impacts is covered over the surface of the area.

We have taken soil samples in order to determine current condition of soil and its fertility, took samples from each soil layer and determined its mash, nitrogen, carbonate, reaction atmosphere, amount of calcium and magnum absorbed to absorption complex, mobile phosphorus, amount of potassium, salt accumulation and electrical conductivity using the national standards of Mongolia.

The locations of soil sampling points are shown in figure 9.

Analytical methods used for defining of soil fertility (productivity) are described in table 3.

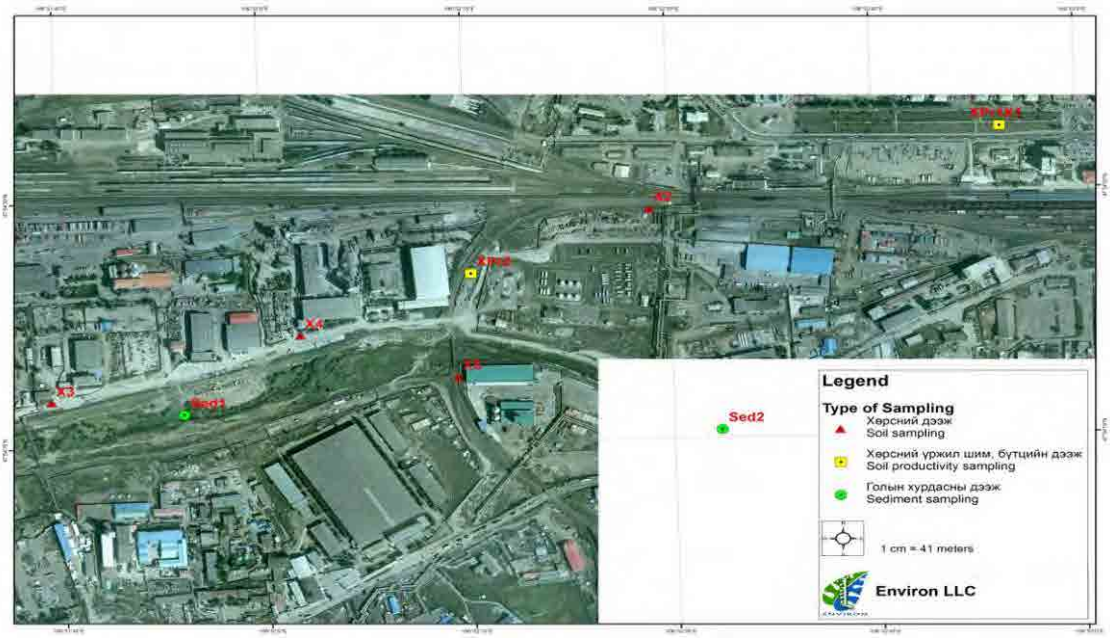


Figure 9. Location of soil samplings

Table 3. List of methods and their precision

Name of substances	Analytical methods	Accuracy
Humus	I.V. Tyurin	<0,04 mg/100g soil
Total nitrogen	Kjeldaal	<0,04 mg/100g soil
Soil reaction	PH-meter	<0,2
Mobile phosphorus	Machigin	<0,05 mg/100 g soil
Potassium exchange	Machigin	<0,05 mg/100 soil
Soil absorption complex	Trilon.B.	<0,2%
Carbonate	Calcium meter	<0.5%
Mechanical compounds	Method of aerometer and Kachinsky	<0,5%

Current status of soil along the flyover trace

There is very few soil remained along the trace, which still preserve its natural morphological characteristics and fertility because of human impact. Soil in the garden

located in north of UB Railway Central Station is one of these remained soils that has preserved its quality to date.

The south west part of this garden lies under the trace of proposed flyover project.

Figure 10. Garden view in the north of parking area

The garden area has a meadowy black soil and the soil properties are shown below.

Soil profile No.1 that represent meadowy black soil was made in the garden (coordinates of soil sampling: 47°54'33.81"N, 106°52'54.19"E h= 1,110 m above sea level) to the north from UB Railway Central Station.

Figure 11. Landscape of soil sampling area

Figure 12. Soil sample #1

Samples are taken from depths of0- 20cm and 25-35 cm respectively.

Record of soil outlook (morphology): Some area of this soil is grassless (5% of area) and gravel and fractured rocks occupy 20% of grassless surface and grassy vegetation grows as the base plantation and occupies 15-20% of the overall vegetation cover.

Bushes and woody vegetation with 5-8 cm of height occupy 5-10% of overall vegetation cover and there are lots of holes dug for plantation of wooden vegetation.

Paved road, buildings and construction continue outside of the fenced area.

A. 0-23 cm: Humus accumulation layer. This layer is black, has slight moisture, compound of clay (mechanic) particle, cell structure and sparse accord and has no fractured rocks and gravel. The bottom part of this layer has a rare gravel, clean transition and even boundary.

B. 23-40 cm: Carbonate accumulation layer. This layer is yellow, dry and has rare vegetation root, (mechanic) compound of light clay particle, cell structure and sparse accord and has no fractured rocks and gravel. Transition is clear and boundary is even.

Carbonate accumulation layer of B_2. 40-50 cm and below. It has dark flow on speckled and light brown background. The layer is dry, has (mechanic) compound of light clay, cell structure and dense consistency and no vegetation root. Gravel appears at depth of 45 cm.

The results of analysis defining the soil fertility (productivity) indicators show that:

Soil fertility indicator: A layer of soil mash accumulation has 3.6% of humus, 1.1% of nitrate nitrogen, 0.16% of carbonate, 17.4mg-eq/100gr of calcium exchange, 4.2mg-eq/100gr of magnum exchange, 1.6mg/100 gr of mobile phosphorus, 22.0 mg/100 gr of potassium and reaction atmosphere has alkalinity of (ph=8.3), electrical conductivity 0.170ds/m and low salt accumulation (0.05%).

B soil layer has 1.7% of humus, 0.03mg/100 gr soil of nitrate nitrogen, 0.16% of carbonate, 16.8mg-eq/100 gr of calcium exchange, 2.4 mg-eq/100 gr of magnum exchange, 1.3мg/100 gr of mobile phosphorus,8 mg/100 gr of potassium and reaction atmosphere has alkalinity of (ph= 8.5), electrical conductivity 0.141ds/m and salt accumulation of 0.04% (Table 4).

Table 4. Soil fertility parameters

Profile number	Depth of taken sample	pH	Salt, %	Electrical conductivity, ds/m	CO_2,%	Exchange basis, mg-eq/100 gr		Humus, %	NO_3, mg/100 gr	Fertility elements mg/100 gr	
						Ca	Mg			P_2O_5	K_2O
XPr-1	0-20	8.3	0.05	0.170	0.16	17.4	4.2	3.56	1.10	1.6	22.0
	25- 35	8.5	0.04	0.141	0.16	16.8	2.4	1.17	0.03	1.3	8.0

Mechanic composition of soil: According to the soil structure (sample) content of thick and medium particles (1-0.25 mm) sand varies between 1.6-13.0%, amount of thin particle (0.25-0.05 mm) sand varies between 40.5-56.0%, amount of dust with thick (0.05-0.01mm) particles varies between 17.5-20.6% and amount of dust with medium (0.01-0.005mm) particles varies between 6.0-25.2%, amount of thin particle dust (0.005-0.001 mm) varies between 1.9-9,1%, amount of muddy (part with diameter of <0.001) varies between 1.8-6.7% respectively (See table 5). It shows that this soil has mechanic compound of light clay.

Table 5. Mechanic composition of soil (mm)

Section#	Sample	Mechanic particles, % particle size, mm						
		1-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	<0.01
XPr-1	0-20	1.6	56.0	20.6	6.0	9.1	6.7	21.8
	25- 35	13.0	40.5	17.5	25.2	1.9	1.8	28.9

This soil has preserved its abundant natural fertility.

Soil affected by human factors. Most soil cover along the trace is strongly affected by human activity and the morphological state and fertility have been changed greatly. Most soil along with the trace is degraded either under road asphalt cover or fully covered with a cement layer in some areas, and lost its natural fertility and has been drastically changed due to pavements, deteriorated and became naked (See figure 13-14).

Figure 13. Soil nearby proposed flyover project is naked and compacted

Figure 14. soil nearby proposed flyover project is covered with asphalt road or concrete

Because of intensive human activity soil properties in these areas have been seriously changed from its natural status.

Figure 15. Impact of human factors

Figure 16. Various operational impact

Figure 17. Soil is relatively in good condition within fenced area of households

Figures 15 and 16 show the current changes of soil cover to due human activity.

Minor impacts are caused to soil in some of areas under households and small buildings along Flyover project trace (See figure 17).

Native topsoil will not be affected much by construction of Flyover project as soil in this area already has been deteriorated, naked and polluted due to vehicles, machinery and pedestrians.

However, soil in fenced areas, where households live is in a relatively good condition. Sampling of soil presenting compacted black meadowy soil was taken in the fenced area of Tsuurden LLC located to the south between railroad and Dundgol River. The sampling place was chosen here, because Flyover Bridge will pass through this place.

Soil sampling No. 2 carried out at coordinates of 47°54'25.32"N, 106°52'15.06"E at absolute height of h=1,280 m.

Figure 18. Some landscape view along planned Flyover

Figure 19. Soil layers

Results of soil morphology are shown in below.

Some soil of this area (75% of the area) is grassless and naked. Gravel and fractured rocks (40% of respective area) lie on grassless surface. The weed occupies the majority among the gramineceous and it has 1.8-6.7% of specific cover and 15-28 cm of height.

A. 0-25 cm: Humus accumulation layer. It is black colored soil with slight moisture content, vegetation roots, mechanic composition of light clay particle, cell structure, sparse consistency and fractured rocks and gravel. There is some gravel in the lower part of this layer, the transition is clear and boundary is even.

B. 25-40 cm: Carbonate accumulation layer. The layer is light brown and has rare vegetation roots, mechanic composition of light clay articles, cell structure, dense consistency and plenty of fractured rocks and gravel. The transition is clear and boundary is even.

BC. 40-50 cm of transition layer between carbonate accumulation layer and soil generation rocks. It has light white flecks on light brown background. It is dry and has mechanic composition of light clay particle, cell structure, dense consistency and no vegetation root. Gravel increases from depth of 45 cm.

Results of analysis, which determined the fertility characteristics of this soil show the following: A layer of humus accumulation of this soil contains 1.6% of humus, 1.22mg/100 g of nitrate, 0.21% of carbonate, 18.2 mg-eq/100 gr of calcium exchange, 5.3 mg-eq/100 gr of magnum exchange, 1.0mg/100g of mobile phosphorus, 14.0mg/100 g of potassium and alkalinity of reaction atmosphere of (pH=8.6), electrical conductivity of 0.170ds/m and low salt accumulation of 0.05%.

B layer of this soil contains 1.7% of humus, 0.03mg/100g of nitrate, 0.16% of carbonate, 16.8 mg-eq/100 gr of calcium exchange, 2.4 mg-eq/100 g of magnum exchange, 1.3mg/100 g of mobile phosphorus, 8 mg/100 g of potassium and has alkalinity of reaction atmosphere of (ph= 8.5), electrical conductivity of 0.180ds/m and 0.06% of salt (Please see table 6).

Table 6 Soil fertility characteristics

Section number	Depth of taken sample	pH	Salt, %	Electrical conductivity, ds/m	CO_2,%	Exchange basis, mg-eq/100 gr		humus, %	NO_3, mg/100 g	Fertility elements mg/100g	
						Ca	Mg			P_2O_5	K_2O
XPr-2	0-20	8.6	0.06	0.180	0.21	18.2	5.3	1.6	1.22	1.0	14.0

Mechanic composition of soil shows the following: According to the soil sample, amount of sands with thick and medium (1-0.25mm) particles varies between 1.6-13.0%, amount of soil with thin (0.25-0.05 mm) particles varies between 40.5-56.0%, amount of dust with thick particles (0.05-0.01mm) varies between 17.5-20.6%, amount of dust with medium (0.01-0.005 mm) particles varies between 6.0-25.2%, amount of dust with thin particles(0.005-0.001mm) varies between 1.9-9,1%, amount of muddy parts (<0.001 mm of diameter) varies between 1.8-6.% (Please see Table 7). This shows that this soil has sandy mechanic composition.

Table 7.Soil mechanic composition

Section №	Sample	Mechanic particles, % particle size, mm						
		1-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	<0.01
XPr-2	0-20	2.4	50.7	31.2	3.1	7.5	5.4	16.0

However A layer of fertile humus of the land is preserved; the fertility has degraded a lot due to erosion under pedestrian walk in the fence and exfoliation of vegetation cover and grinding down.

3.1.3 Land Use

Basic land use status of Mongolia as of 2011 is compared with previous years in table 8 according to main classification of Unified Land Fund.

Table 8.Land use status according to the main classifications of Unified Land Fund of Mongolia, in thousand hectares

Main land use classification	**2009**	**2010**	**2011**
total territory	156 411.6	156 411.6	156 411.6
Agricultural land	115 824.7	115 525.8	115.490.8
City, village and other settlement area	543.8	620.6	667.3
land under road, pipeline and network	383.6	407.1	429.2
Land with forest resources	14 315.4	14 297.9	14 260.0
Land with water resources	665.5	682.8	686.8
Land for special purposes	24 917.0	24 877.4	24 877.4

As land use status shows, there is a trend of increasing the portion of land under the road, pipeline and networks. For example, road, pipeline and network land was 383.6 thousand hectares in 2009, in 2010 it increased by 6, 1% and in 2011 it increased by 11.9%.

There is only one landuse classification in the project area, which is -industrial zone. This area belongs to industrial district of Ulaanbaatar city, as many of industrial plants and small and medium enterprises are concentrated in the western side of the city. Industrial enterprises compresses about 80% of total territory of 4th Khoroo of Bayangol and remaining portion, which is located to north west corner of this khoroo is occupied with some apartments. But industrial sites are continued next to apartment buildings.

Subsidiary organizations of Ulaanbaatar Railway such as Passenger's wagon depot of Ulaanbaatar railway, Service division No.2, Fire station and auto service department as well as Gasoline stations of Badral LCC and Just LLC are located to the north of the project area along two sides of Narny Road of the 4th khoroo.

The private companies like Suuri LLC, Wagner Asia Equipment LLC, Global Shariin Gol LLC, Magma Od LLC, Nature Urguu LLC, Mongol Tamkhi LLC, Mongol Tulkhuur LLC and Mon Karotage LLC, which make business on production and service (construction factory, warehouse of flammables and lubricants, maintenance and service of heavy duty machinery, storage and trade) are located in Western Teeverchdiin street to the north of Dund river along the access road.

Moreover, two persons D. Erdenebayar and D.Erdenebaatar are operating their private business in the 0.3 hectares of territory to the east of Ajilchin intersection, southern part of Western Teeverchdiin Road.

Mr D.Erdenebaatar built a public house in his owned area without permission of land authority and is renting it to 22 households of 72 people, which permanently live in this house. In addition to this, three households, which live in gers, are settled on the Shore of Dundgol River without any permission.

Fuel tank storage of Khuvsgul Trade LLC is located in the eastern part of the proposed flyover bridge. Factory of Gobi LLC is located to the south of Dundgol River, which is south of the project implementation area and over 30 people of 6 households are living next to this factory.

3.1.4 Climate

Ulaanbaatar has a short and warm summer and a long, dry, cold winter as the city is comparably located on the elevation. Most months of the year have an average temperature below zero. The city has centralized heating and energy system that provides an energy supply to its clients during this time.

The project implementation area covers the west side of Central Railway Station of Ulaanbaatar Railway and the territory of Bayangol (Industrial areas) and Khan-Uul districts.

Dund River separates the 2 districts mentioned herein above and it is dried up during the most seasons of the year.

Precipitation According to the data of the last 14 years (From 1998 to 2011), annual average precipitation is 247.8 mm/year, precipitation in May-September is comparably high, and the average maximum precipitation falls in July which is 58, 6 mm/month.

The month with the most precipitation within 14 years was August 2000 with 137.7 mm/month.

The day with the most precipitation was recorded on July 2009 with 44.8 mm/day which is 40 mm/day more than average precipitation for the last 14 years and there is the second month with most precipitation was June 2000 with 42, 8 mm/day of precipitation.

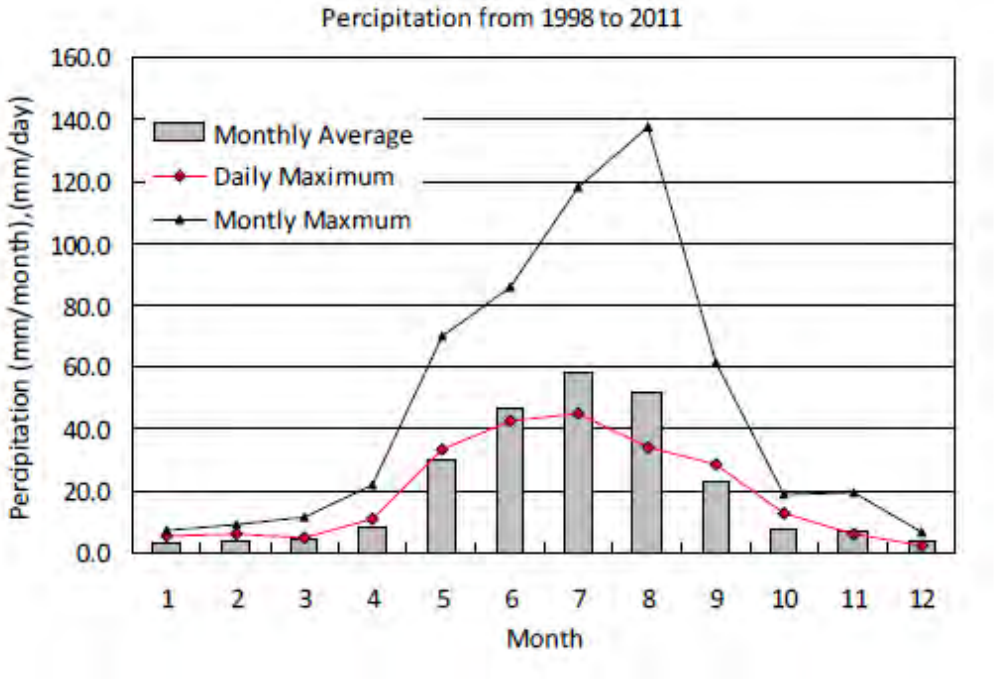


Figure 20 Precipitation dynamics of Ulaanbaatar city over 13 years.

Snow cover Average number of annual days with snow cover is 68 days and the thickest snow cover reaches 15 cm. The first snow falls in September and a permanent snow cover is generated at the end of October or beginning of November. Snow cover becomes permanent in mid November and the snow disappears in mid to late May. Number of days with snow is 6-8 days per month.

During the construction peak season between May-September, the number of average days with precipitation ranges 10-16 days per month.

Solar radiation The monthly total average of solar radiation of Ulaanbaatar varies between 180 – 420 w/m^2 and the amount varies depending on forms of landscape and specifics of forest. For example, forest in the back of mountainside of Shiljree Mountain (Terelj, Protected area) has the minimum solar radiation and Ulaanbaatar Station has a comparably high solar radiation according to the measurements (Figure 21).

Ulaanbaatar has many bright days in May and a naturally high amount of solar radiation and December has the minimum amount of total solar radiation due to a short term of sunshine.

In terms of the project implementation area, it is located under same terms and conditions as Ulaanbaatar station regarding landscape specifics. Therefore, allocation of solar radiation is same.

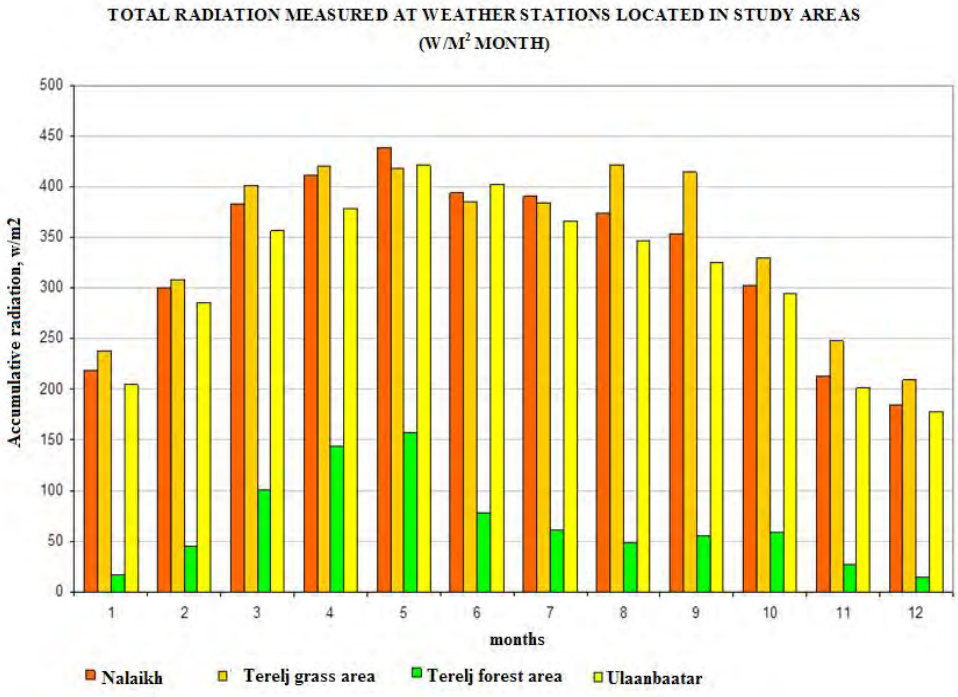


Figure 21 Monthly allocation of total solar radiation

(Source: Ya. Jambaljav, Possibility of using outline method to study of multitemporal permafrost in mountainous area, 2009)

Evaporation. Evaporation allocation is shown according to observation forecast of Metrological Station of Ulaanbaatar.

Table 9 Evaporation allocation

IV	V	VI	VII	VIII	IX	X	IV-X	XI-III	Year
6.9	11.8	15.2	14.0	12.5	8.0	4.4	73.2	51	78.2

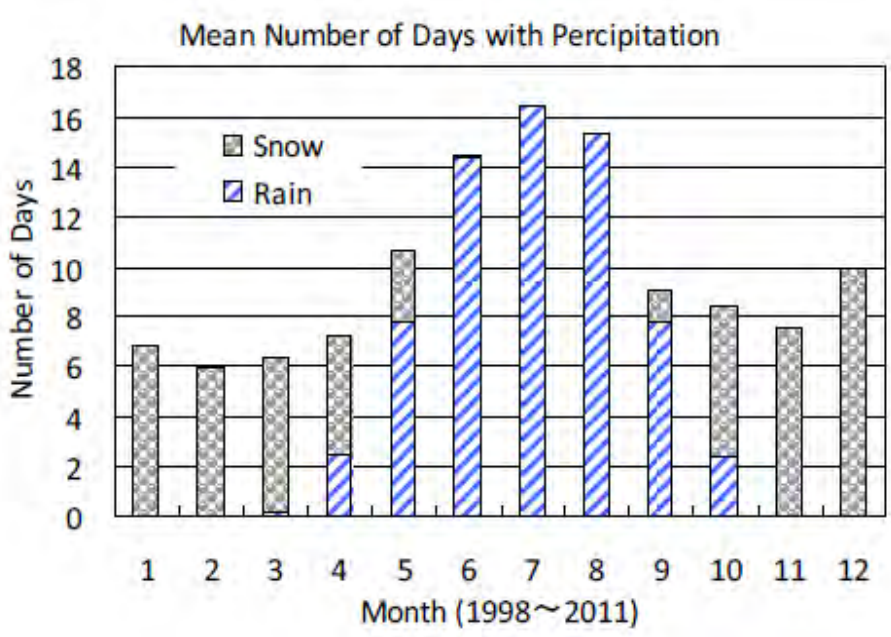


Figure 22 Number of days with precipitation

Winter season. In terms of seasonal duration, this region belongs to Khan Khentii mountainous region of the country.

The winter in Ulaanbaatar starts in the last week of October and continues for 163 days. The main characteristics of winter is that the temperature starts from -5 degrees and reaches down to -49 degrees in the river valleys (-45 degrees in the mountain), the snow thickness is 10-20 cm and snow is fluffy due to lack of wind and it has lots of hoar-frost and high relative moisture (more than 70%). Specifics of winter are that it is very cold in the river valleys and it is very harsh with strong wind.

Spring season. It starts in April and ends around June 1-13. Spring is shorter in the mountains Khan Khentii and Bogd Khan and lasts for 57 – 69 days.

The specifics of spring in the project area are that it is dry (in spite of this, it is more humid than in other areas, humidity is 45-50%). However the spring is windy, the daily average wind speed reaches 1-3 m/sec in forest area, 3-4 m/sec in the river valleys and maximum wind speed reaches 20-25 m/sec frequently.

However, the temperature amplitude is high. However, compared to other areas it has lower variation, its daily average is 12-14 of Celsius and the maximum amplitude reaches 35-37 degrees of Celsius.

Summer season. Summer starts in the first week of June, lasts for 90 days and ends within the first week of September in Ulaanbaatar region.

The main characteristics of summer are that it has a few precipitations; it is humid, cool, and cloudy and has low wind.

Autumn season. It is relatively short and lasts 51 days from the end of summer and beginning of winter. The main specifics of autumn are the wind increases and suddenly cools that reach -5 degrees and gets cold.

The first snow falls earliest at the end of August and stays there in high mountainous area.

Seasonal climate variations. The riverhead and Basin of Tuul River entirely belongs to the Strictly Protected Area of Khan Khentii and Bogd Khan Mountains and has a harsh continental cool climate. The main climate conditions are described by high air temperature amplitude of days, months and year, low air humidity, uneven allocation of precipitation, a harsh continental climate with a hot summer and cold winter and etc.

This creates specific climate conditions e.g. a long winter with not much snow, short summer with hot days and very cool nights, a constant lack of air moisture and precipitation.

3.1.5 Geology, Geomorphology and Permafrost

The geological composition of the Ulaanbaatar region consists from the Paleozoic era carbon, sandstone and slate of the Cretaceous age of the Mesozoic era and granite of the Jurassic age as well as of the Mesozoic era is mostly spread in the southern mountainous area.

Sediments consist from the deluvian layer of quaternary that is layered sediments mostly generated from sandstone and slate of the Mesozoic era and sediments of the alluvial layered seams are spread in the central areas. Geological structure of Ulaanbaatar is shown in Figure 23.

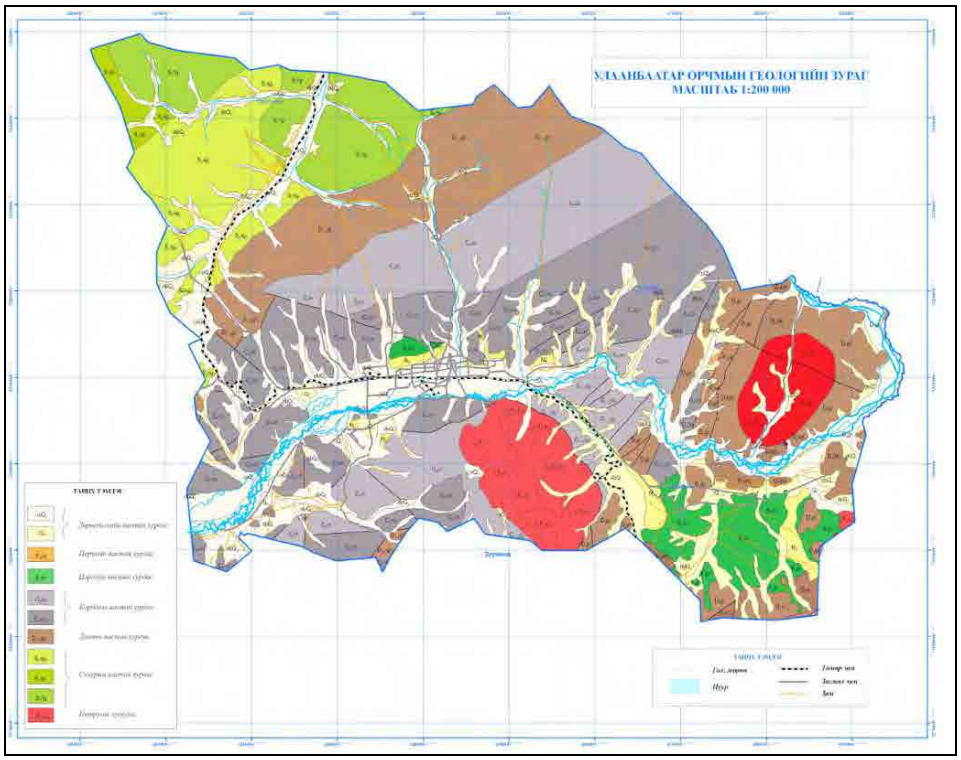


Figure 23. View of geological structure of Ulaanbaatar city

Dundgol River is an affluent of Tuul River and flows through the project area. Dundgol River is located on a mostly equally wide valley of the first terrace of Tuul River. However Dundgol River valley is disturbed with many artificial dams and trenches due to various engineering activities.

In terms of elevation, it is located within range of 1,277. 5 – 1,281.2 m above sea level. In other words, 3, 7 m of difference in the height can be observed, this may have been created by the engineering operations mentioned herein above.

According to geotechnical engineering survey, the project area consists from 5 main sediments; topsoil with dumped soil, gravel with various particles, muddy gravel with sand, gravel with sand and clay, muddy sand with gravel of upper-modern quaternary alluvian-deluvian age. Its thickness was continued while drilling reached at the 20th m in deep.

According to the existing literatures, thickness of this sediment is 50 m and more.

Layout of cross-sections describing the geological composition of the project implementation area is shown in Figures 24 and 25.

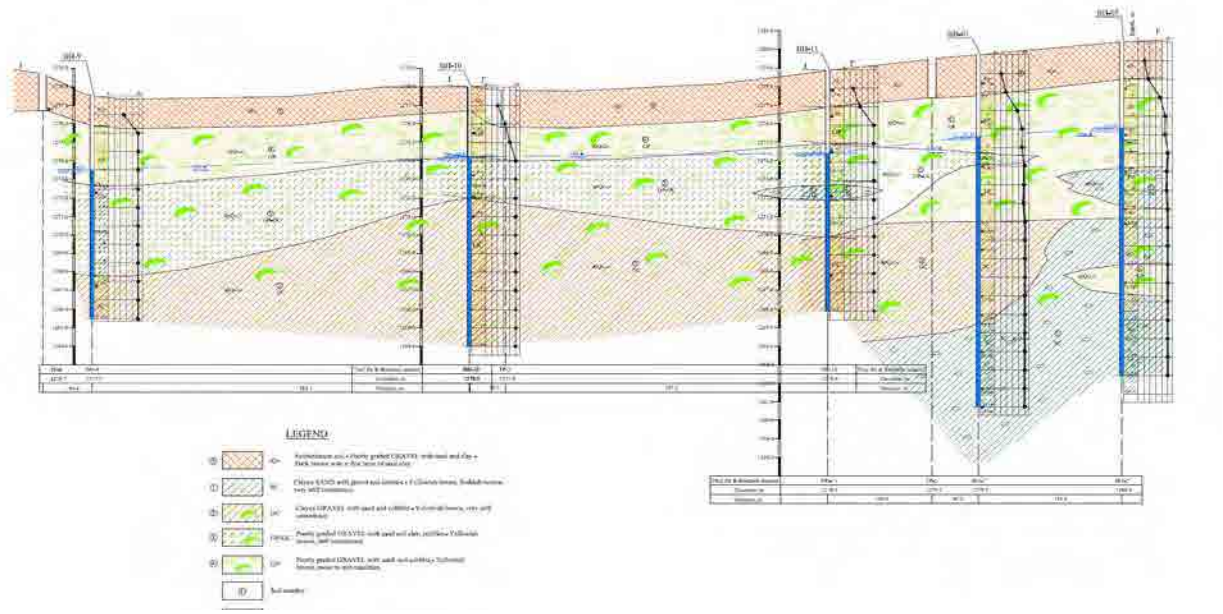


Figure 24. Geological Cross-section of Project Site (East-West)

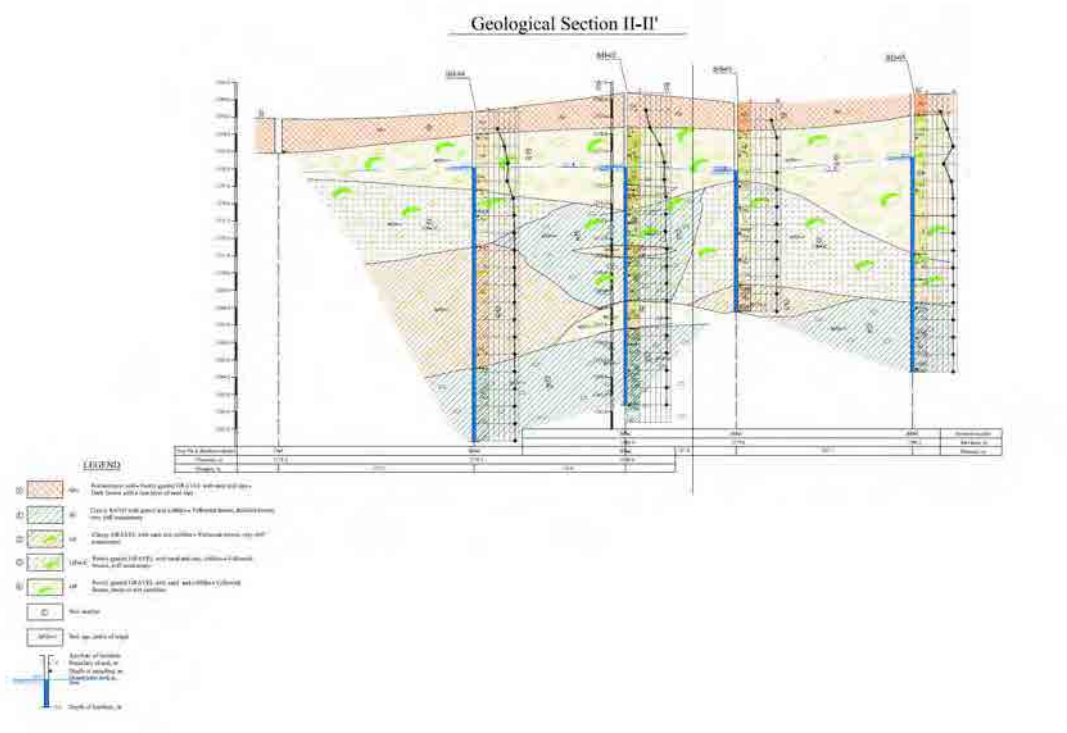


Figure 25. Geological Cross-section of Project Site (North-South)

Permafrost, frosting and defrosting of ground soil

According to a geological map of Mongolia with scale 1:1500 000 and the multitemporal permafrost map of Terelj, Nalaikh and Ulaanbaatar with scale 1:100 000, the territory of Ulaanbaatar region belongs to a region with an uneven distribution of permafrost. However, there is no permafrost in the territory of Ajilchn flyover project area.

Occasional permafrost can be generated in humid soil with a high content of clay in the valleys of some rivers relevant to the specifics of the geographical location and climate of Mongolia. To note, occasional permafrost may appear in the back side of some tall buildings with low direct radiation of sun in settlement areas.

However, permafrost has not been identified in the drilled holes within the project area.

According to seasonal frosting and defrosting map of ground soil of Ulaanbaatar with scale 1:25 000, the Ajilchin Flyover project area located in the A and B zones of seasonal frosting and defrosting of ground soil (Figure 26).

The zone A covers terrace of Dundgol River at the end of Tuul and Selbe rivers and has a gravel soil that consists from sand and sand rock of alluvial origins.

Average annual temperature of the ground soil is 2, 4 – 2, 5 degrees of Celsius, fluctuation amplitude of on ground temperature is 22 – 24 degrees of Celsius, frosting depth of ground soil is 2, 6 – 3, 3 m in a regular natural condition.

The zone B covers the first terrace of Tuul River and consists from sand, sandrock and gravel of alluvial origin.

Average annual temperature of ground soil is 2, 3 – 2, 5 degrees of Celsius, fluctuation amplitude of on ground temperature ranges in 22-24 degrees of Celsius, frosting depth of ground soil is 3, 3-3, 5 m in a regular natural condition.

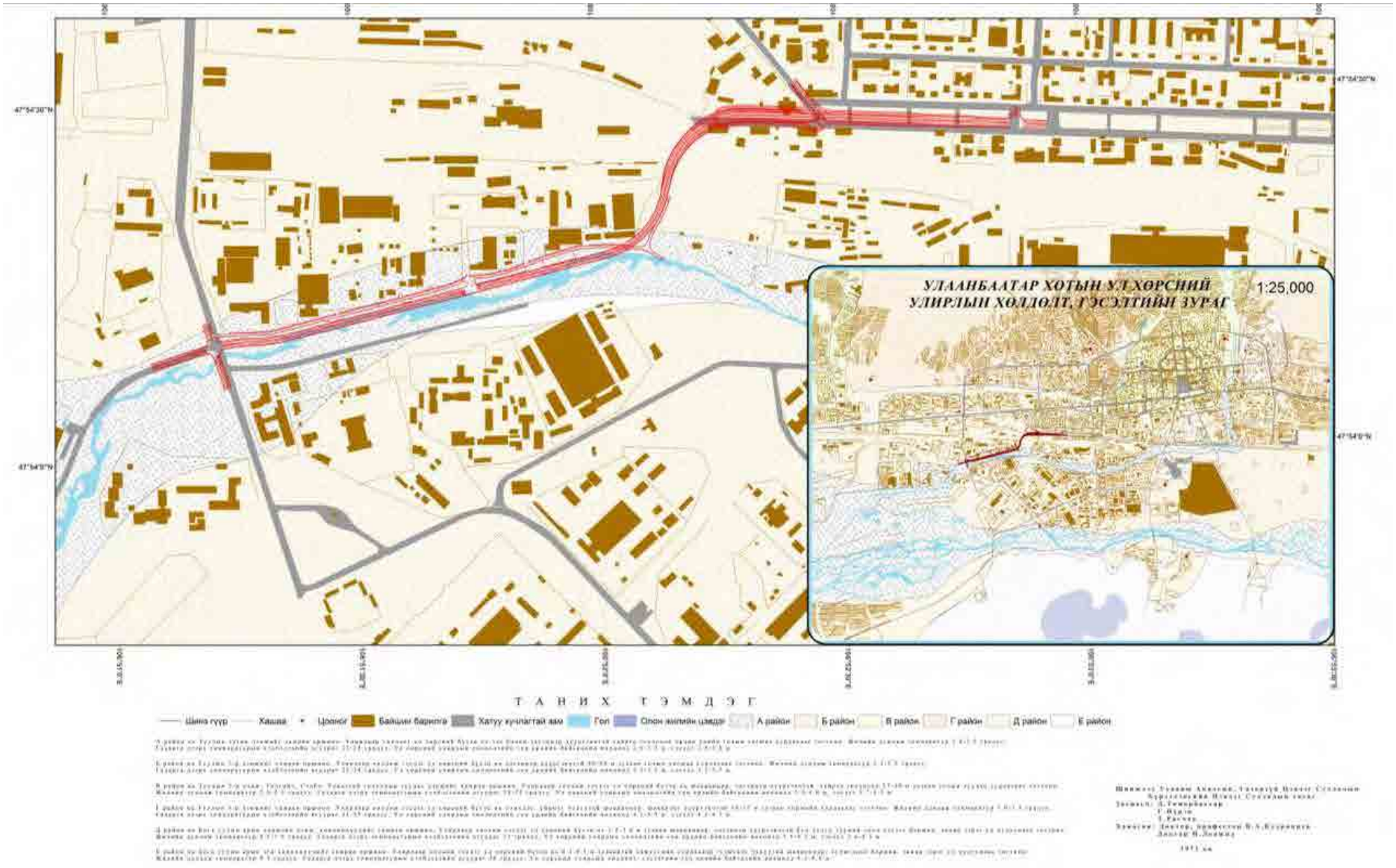
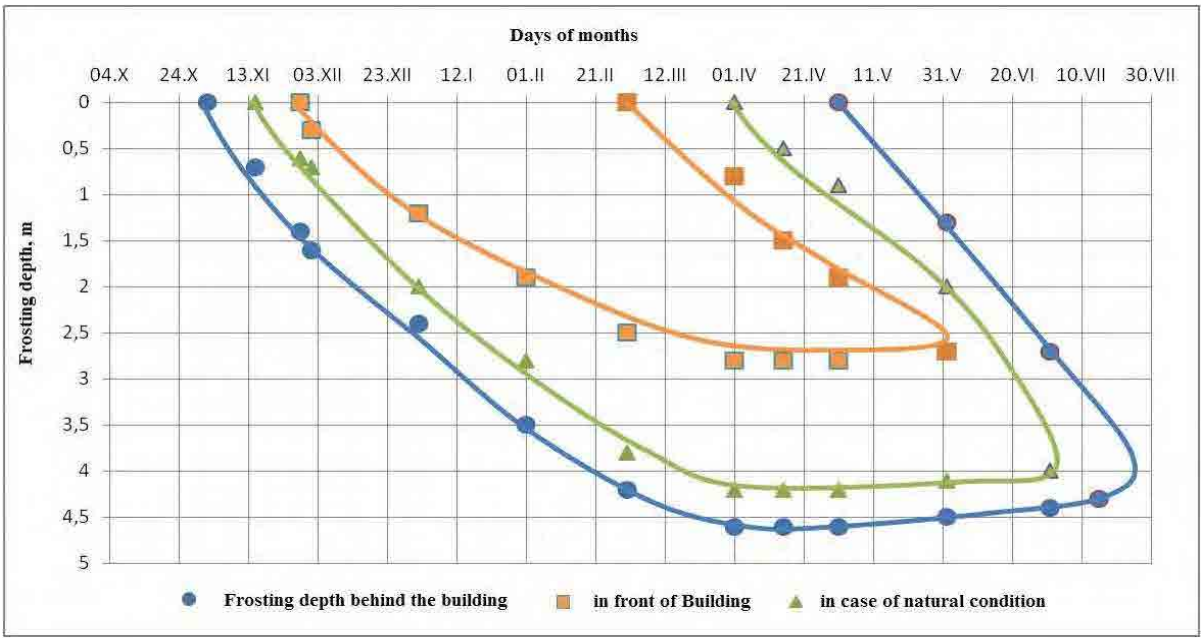


Figure 26. Frosting and Thawing Map of Ground Soil of Ajilchin Flyover Project Area.

Seasonal frosting of ground soil starts within the Ulaanbaatar territory in the beginning of November and the ground soil is completely frozen in March. Defrosting starts in the beginning of April and finishes in July. Duration of earth work, depth of building and construction foundation can be determined based on determination of dynamic progress of seasonal frosting and defrosting as well as the frosting depth. It is appropriate to carry out earth work between May-November in Ulaanbaatar. But the depth of ground soil seasonal frosting within the project implementation area varies between 2.6-3.5 m during regular natural conditions.

However dynamic process of seasonal frosting and defrosting of ground soil as well as frosting depth can be changed drastically depending on the conditions induced due to various engineering activities in the surface and underground. Such conditions can be created during project construction and after construction Flyover bridge.

To illustrate changes in dynamic process of frosting and defrosting and depth of frozen due to a construction, a case study results with 2-storey building of Geographic Institute of Academy of Sciences are described here shortly. This building is located in the Selbe River valley, which is 4 kilometers away to the east of project site. The frosting process and depth in front of as well as behind of this building found to be quite different Figure 27 (D.Tumurbaatar, 2004).



Months

Figure 27. Dynamic process of ground soil frosting in various natural and unnatural conditions

Change in frosting depth is mostly due to direct sun light that reaches the soil. If there is a barrier, either natural or manmade that interfere sunlight to soil, then difference in the frosting depth can be reached up to 2 meters in depth.

The other factors that contribute to the frosting depth, in addition to the sun lights, are mechanical composition of soil, clay content and particle size.

Deformation of buildings resulted from unevenly lifted foundation of building due to frosting bulge of ground soil is quite common in Ulaanbaatar.

3.1.6 Surface water reserve

The rivers Tuul, Selbe, Belkhi, Uliastai, Gachuurt, Khul, Uvur gorkhi, Tolgoit and Turgen run in north, west, east and southern parts of the capital.

The biggest surface water network among these rivers is the Tuul river whose open flow regime became more transformable due to specific natural factors that have occurred in terms of time and space.

The Selbe river is one of affluent of Tuul river. It disgorges from Ikh Bayan(2033m) a small mountain in the south western mountainside of Baga Khentiii and breach of Tsokhiot mountain, flows between short mountains through forest valleys and flows in to Tuul river around Ulaanbaatar (Power station#4).

The river has 2 major mouths of the rivers Khandgait and Belkh at headwater and the downstream of the river. The dry swashes take water from mountains on the both sides and refresh the Selbe River during abundant rainfall.

The length of Selbe River is 36, 6 km, water accumulation area is 314 square kilometers, and average height of basin is 1621 m (See table 10).

The average width of the river valley is 100-150 m, 400-500 m in some areas, the height of the side slope is 4-5m and has meadow vegetation.

The river watercourse has a gradual change, aggradations and glide. In some areas there are minor islands. The river watercourse is 20-25 m in wide banks, the average depth of water is 0, 1-0, 5 m, height of the river bank is 0, 4-0, 6 m.

Table 10. Average indicators of flow of Selbe river per many years

Main beam	Water accumulation area, km^2	Average multiyear discharge, m^3/sec	Flow module, l/sec	Flow volume, X $10^6 m^3$
Selbe Ulaanbaatar	314	0.80	2.60	88.1

Main water nourishment of the Selbe River is summer and autumn rainfall and the water level of the river varies greatly during these seasons. However the spring snow melting flood is observed during the end of April and beginning of May, its duration and size are short.

But the amount of spring flood takes 10-12% of the total annual flow depending on precipitation volume of previous year and precipitation during the cold season.

Precipitation that falls during the cold season (From October to April) plays the main role in the composition of flow of the river and the lake's spring flood. The summer drought starts a while after the spring flood and continues from mid July to mid September.

The river freezes up to its bottom and has no flow in the winter from mid November to late March. In terms of classification of river and lake regime, the Selbe River belongs to river with spring flood and rainfall flood of warm season.

Permanent regime survey of the Selbe River was initiated effectively from 1985 by establishing a water study patrol in the direction of Dambadarjaa. This patrol was closed in 1991 due to deficiency of human power and equipment and a new permanent water study patrol was established in 1994 nearby the Sanzai sanatorium and this patrol is implementing the main program of water study network and measuring and observing regime elements e.g. water level, discharge, water temperature, ice phenomenon and its thickness (Table 11).

Table 11. Morphological parameters of Selbe River water accumulation area

#	River- patrol	Water accumulation area, square kilometer	Length of river, km	Average height, m	Watercourse dip %	Forest area, %
1	Selbe-Sanzai	34.02	8.3	1620	21.3	63.7
2	Selbe-Dambadarjaa	188	26.2	1510	12.4	54.6

However relevant results of hydrological study noted on the permanent patrol show that the average amount of surface flow passing through the Tuul river over many years is 24,0-800,0 m^3/sec, it drastically increases during flash floods.

Annual flow allocation of the Selbe river is not even. Spring flood is observed in May in a year with abundant snow, the flow decreases starting from June and the maximum flow is observed starting from July when rainfall is abundant during July-September period (Table 12).

Table 12. Observed annual monthly average flow of Selbe River

#	River-patrol	V	VI	VII	VIII	IX	X	Annual
1	Selbe-Sanzai	0.53	0.38	0.21	068	0.8	0.8	0.7
2	Selbe-Dambadarjaa	1.14	1.08	0.98	0.76	0.70	0.33	0.48

Due to lack of observation materials of the Selbe River, annual flow distribution is calculated by a similar method used for rivers located in the western mountainside of Khentii Mountains and it is shown in Table 13.

Table 13. Annual flow distribution

Month / Water abundance	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III
Abundant	6.0	14.6	10.3	21.6	25.0	10.7	7.7	3.6	0.0	0.0	0.0	0.5
Regular	4.2	14	11	25.6	17.8	14.8	9.0	2.6	0.4	0.0	0.0	0.6
Diminished	6.0	10.8	9.8	21.6	25.5	14.6	7.8	3.2	0.0	0.0	0.0	0.6

The diminished flow of the Selbe River is divided into flows of cold and warm seasons.

The diminished flow of the cold season starts from the river frosting and continues until the defrosting and flow size is relatively small compared to summer due to a lack of ground water nourishment during the winter season.

The diminished flow of the warm season starts from the end of the spring flood and continues to the beginning of summer rainfall, from summer rainfall flood to the diminished period of the winter.

The monthly amount of the minimum flow during warm season is 2-3.5 l/sec $km^{2,}$ the monthly amount of the minimum flow during the cold season varies between 0.15- 0.25 l/sec km^2

Figure 28. Location of chosen beams

Observation and hydrological measurements required for assessment of regime and reserve water quality of the Selbe River are done at 3 points chosen along with Selbe River on July 9, 2012.

Measurement of depth, speed and discharge of river is done according to ''Instruction for water, weather and environment analysis Sh3.III:00'' issued by National Agency for Metrology, Hydrology and Environment Monitoring.

The maximum depth of Selbe river is 45 cm at beam W1, the maximum speed is 0.26 m/sec at beam W2 (Table 14).

Table 14. Discharge amount of Selbe River as of July 9, 2012

1	Beam	W-I	W-II	W-III
2	Discharge, m^3/sec	1.1	1.8	0.97
3	Coordinates of beam locations	$47^0$54'20.58" $106^0$52 ^{I} 11.44 ^{II}	$47^0$54 ^{I} 16.13 ^{II} $106^0$51 ^{I} 42.26 ^{II}	$47^0$54 ^{I} 17.66 ^{II} $106^0$54 ^{I} 27.54 ^{II}

Estimation of solid flow of the Selbe River is calculated by the following formula in relation to average muddiness of the water (ρ=100gr/m^3).

$R_0=\rho_0*Q_0/1000$,

R_0 - Drift sediment discharge

ρ_0- Amount of muddiness, 100 gr/m^3

Q_0- Flow norm, 0.8m^3/sec

Drift discharge is R_0=0.086 kg/sec.

Amount of bed sediment is taken equal to 20% of drift sediment and total sediments are equal to R_0^{total} =0.103kg/sec.

Table 15. Mechanic composition of sediment in bottom of the Selbe River

Sampling Location	Percentage of fracture, % per various diameters of fracture					Diameter of fracture, mm	
	200-100	100-50	50-20	20-10	<10	D max	D min
upstream in 150 m from Dundgol River Railroad Bridge	-	12.0	12.8	37.6	37.6	100	21

3.1.7 Underground water resources

As study results show, amount of underground nourishment within the study area is estimated at 9.5-45.6%, amount of water from melted snow varies between 0.2-25.2percent. Amount of rainfall water is 29.2-90.3%, the minimum rainfall was 29, 2% in 1972, the maximum reached 90, 3% in 1994.

The amount of rainfall had an increasing tendency in 1980's and 1990s.

During the years with an abundant rainfall, the amount of ground water flow in the river nourishment was drastically decreased and river has a major tendency to nourish the ground water. In the years with less rainfall, the main nourishment of river is from the ground water.

A natural tendency of nourishment of the Tuul river is mainly from the ground water and is clearly shown on Figures 29 and 30.

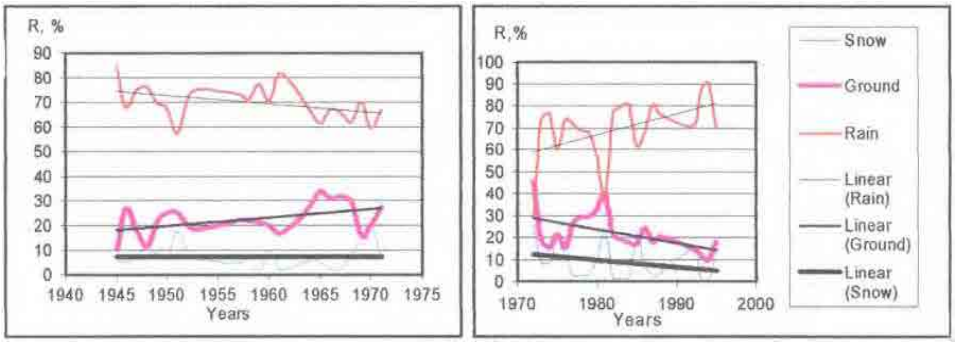


Figure 29. Change and tendency of nourishment of Tuul River flow

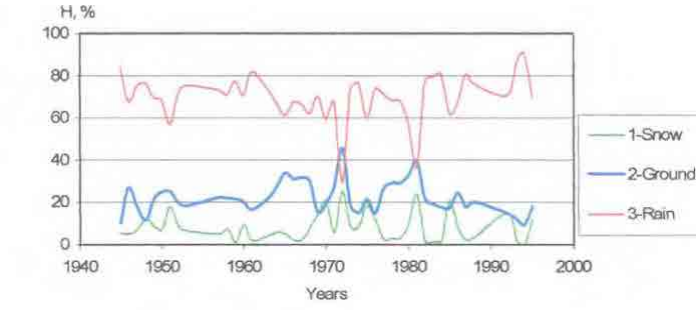


Figure 30. Amount and change of nourishment of Tuul River

3.2 Ecological Resources

3.2.1 Biodiversity Status

The Ulaanbaatar region has a numerous biotypes of nature e.g. water, marsh, forest, forest-steppe, steppe. Within the urban territory, its ecological micro environment e.g. ger districts, tall buildings, factories, summer camps, waste disposal areas create the favorable condition for many birds to come and acclimatize.

Steppe stretches along the valleys of the rivers Tuul, Selbe, Uliastai and Dund that flow through the city.

In addition, water reservoirs (frost-free) originating from power stations, retreatment facilities and water pond (freezing) established in river out gush, sand and gravel pits located to the south west of the city are creating the suitable environment for migratory birds to not only gather, but to stay over summer, nest and lay as well as creating possibilities for other birds to have drinking water throughout four seasons of the year.

It was observed that there are 30 species of lascivious mammals and 205 species of birds of 14 groups, 40 folks and 110 types.

66 species out of above species nest and lay, 21 species hibernate here migrating from abroad and these species create the main core of city birds.

138 species of total birds are migratory and 66 species are settled birds and settled birds occupy 39, 4% of permanent birds living in the center of city.

The western area of the railway station involved in our surveillance is not far from Bogd Mountain.

Small spring Dundgol with bushes and tall grasses flow in the middle of it. The tall buildings, vegetable warehouses, small processing factories for wheat and flour, railway, auto and dirt roads, planted trees and garden located in some areas create the possibility for many species of birds to nest.

The following mammals were identified in the project area (Figure 31):

- *Microtus gregalis* - Narrow headed vole,
- *Meriones unduiculatus* - Mongolian gerbil,
- *Ochotona dauurica* - Daurian Pika,
- *Lepus tolai* - Tolai hare

The number of these animals isn't many; these animals live along with river dams, bushes and shelters of bushes and belong to range of prey of the predatory birds living nearby the river.

Not many birds gather near the railway and the following settled birds constantly live nearby the vegetable warehouse; *Columba rupestris, Columba livia, Passer montanus, Passer domesticus, Corvus coron, Corvus corone, Pica pica, Pyrrhocorax pyrrhocorax*.

The followings small birds e.g. *Parus major, Ficedula parva, Carpodacus erythrinus* and predatory birds e.g. *Buteo hemilasius, Milvus migrans, Falco tinnunculus* sometimes live in the area in front of the fence with aspens and bushes.

It has been long time since this area lost its natural look and an artificial environment had been created by human. Therefore no additional negative impacts will be caused to the fauna there once the Flyover Bridge and access roads will be constructed.

		
Lepus tolai	*Meriones unduiculatus*	(Daurian Pika) *Ochotona Dauurica*

Figure 31. Mammals living in the Dundgol River basin

The aspens, elms, bushes, brushwood naturally grown along with the Dund River, small islands and creeks with minor bulrushes, tall grasses, and stream and lentic water become the rare environment for birds of many species to nest, rest and find their food. The birds e.g. Turdus ruficollis, Lanius isabellina, Phoenicurus phoenicurus, Phoenicurus auroreus, Motacilla alba, Motacilla flava, Ficudula parva, Saxicola maura, Parus major,Parus cyanus, Passer montanus,Carpodacus erythrinus, Uragus sibiricus, Emberiza spodocephala and big birds e.g. Pica pica, Corvus corone, Corvus corax, Milvus migrans nest and lay in major aspens and brushwood along with Dund river and birds e.g. Buteo hemilasius, Circus aeruginosius, Accipiter nisus, Falco cherrug, Falco tinnunculus, Falco amurensis, Perdix dauurica, Vanellus vanellus, Charadrius dubius, Tringa glareola, Actitis hypoleucos, Columba rupestris, Columba livia, Streptopelia orientalis, Cuculus canorus, Athene noctua, Apus apus, Apus pacificus, Upupa epops, Dendrocopos major, Dendrocopos minor, Riparia riparia, Hirundo rustica, Delichon urbica,Eremophila alpestris, Anthus hodgsoni, Anthus spinoletus, Pica pica, Corvus dauurica, Pyrrhocorax pyrrhocorax, Phylloscopus trochiloides, Phylloscopus inornatusare seen when they look for food and eat during their migration.

During the winter the following birds enter this area: Bombycilla garrulus, Acanthis flavirostris, Pyrrhula pyrrhula, Prunella montanella.

The most birds living along with direction of the Flyover bridge construction area are mostly adapted to vehicle, train and human noise and they are no anymore scared of these noise.

		
Carpodacus erythrinus	Corvus dauurica	Ficedula parva
		
Hirundo rustica	Milvus migrans	Prunella fulvescens

Figure 32. Birds nearby overhead bridge crossing

Heavy duty trucks are still passing through western Teeverchdiin road located in the north of the Dund River. Therefore some of the birds that were living here have fled from this noise, but the remaining birds have adapted to it.

The birds e.g. *Columba livia*, *Columba rupestris*, *Corvus corax*, *Pyrrhocorax pyrrhocorax*, *Apus apus*and *Apus pacificus*, *Upupa epops*, *Motacilla alba* nest and lay on the buildings of companies Mongol Tamkhi LLC, Ilch Khangai LLC and Wagner Asia Equipment LLC and etc.

The list of birds living in the project implementation territory is included in Annex 3.

If the Western Teeverchdiin road is to be expanded and paved, the dust will be reduced and negative impacts to the fauna will be decreased.

The rare and hunting birds included in the Mongolian and international laws, regulations and convention annexes do not vested and live in the project implementation area for Flyover bridge and road.

It has been long time since this area lost its natural look and an artificial environment has been created by human. Therefore no additional negative impacts will be caused to the fauna there since the construction of a Flyover bridge.

But much attention shall be paid on environmental protection, reduction of dust and noise and labor safety must be followed during bridge and road construction.

Aquatic animals. The assessment on impact to river basin, its fishes and others animals is conducted to anticipate and reduce potential impacts from Ajilchin Flyover project.

Research surveillance and sampling had been carried out by the end of July and in the beginning of August. Three samplings were taken in upstream, middle and downstream of the Dundgol River. During this period the rainfall was abundant and an usual thin watercourse inside the river basin had lots of water. Water had sand and mud sediment color and in some areas it had a deep hole of approximately 80 cm.

The basin protected by river dam had lots of wastes and trashes from cement mixture and bushes and weeds are fully grown in some areas and a lot of drying up and evaporation are occurring, resulting in a very thin flow of the Dund river watercourse within the basin.

Besides the contaminated sand and mud of bed sediments, a lot of waste accumulated due to improper human activity (from surrounding factories and services) and dust contamination resulted from many vehicles passing through the river bank.

During the study, there were not many planktons observed but a few chafers and crabs e.g. Daphnia longispina (Lendig), Chydorus sphaericus, Cyclops sp and Euchlanis dilatata occurred rarely in lentic water near the river bank.

The following benthos animals were observed:

1. Gerris sp.
2. Culex sp.
3. Libellula sp.
4. The most common mollusk is a clam of Limnaea species.
5. A few thorn bugs and leeches are spread.

Some of the representatives of benthos animals are shown in Figure 33.

A. Coenagrion sp. B. Corexa sp; C. Limnaea peregra.

Figure 33. Some representatives of benthos animals

These benthos insects rarely live in a contaminated water stream and become an indicator that describes the nourishment supply of fishes and alevins of the Dundgol River as well as river water contamination and ecological disturbance.

3 following species of alevins inhabit in the Dundgol River.

1. Rhynchocypris lagowskii (Phoxinus lagowskii Dybowski)
2. Rhynchocypris czekanowskii (Phoxinus czekanowskii Dyb)
3. Barbatula toni – was the most common alevin that we met (Picture 34).

2 species of following Rhynchocypris groups of fishes become the main food for other fishes living in the crowd.

- Rhynchocypris czekanowskii. Body length reaches 7, 3-10, 0 cm and they inhabit usually in water stream, its main food are floating animals, insects and their larvae. This Rhynchocypris has no benefits for fish culture. Sometimes fishermen use it as badger fly.
- Rhynchocypris lagowskii. Body length reaches 17-20 cm. This fish inhabits relatively in cold water and has a bigger body than other rhynchocypris species. They eat various insect larvae of dry land and water for food. Also, they eat and destroy the spawn of fish culture and other fishes and have no benefits for fish culture. It becomes the prey of other fishes.
- Barbatula toni. It has a cosmopolitan distribution in all the rivers and lakes of Mongolia. It inhabits near the water bottom and becomes the prey of other fishes that live at the bottom. It is a fish of comparably cold water and eats mainly benthos organisms and populates in the first month of summer. The Dund River has lack plankton animals. Therefore, gulfweed and other common animals take main role in the food of immature alevins and adult alevins mostly eat the benthos organisms.

A. Rhynchocypris;

B. Barbatula toni;

Figure 34. fish species in Dundgol River

Planktons and benthos animals, fish species living in the Dund river show that 1) Only alevin inhabits in this river and other fishes of fish culture cannot live in the Dund river due to water quality and a lack of water volume and other degraded environmental factors. 2) Level of river watercourse flow is rather low and it is contaminated by pollution. Therefore, benthos

organisms representing the quality of water are missed in Dundgol River. 3) There have not been recorded any rare and endangered aquatic species.

Vegetation

In accordance with botanica-geographical classification, the Ajilchin Flyover project area nearby the Railway passenger's wagon depot in the territory of Bayangol district of Ulaanbaatar city belongs to transition zone of Mongolian-Daurian mountain steppe and steppe region of Mid-Khalkha.

The Ajilchin Flyover project area represents more the characteristics of Tuul river basin and meadow of the Dundgol River. The vegetation species of project area have been selectively collected during field work (Grubov.V.I, Determinant of vascular vegetation of Mongolia, Science, 1982) are presented as below:

Type of naked seeded plants:

Salicacaeae Lindl.

Salix microtachya Turcz.

Populus tremula L.

P.laurifolia

Ulmaceae Mirb.

Ulmus pumila L.

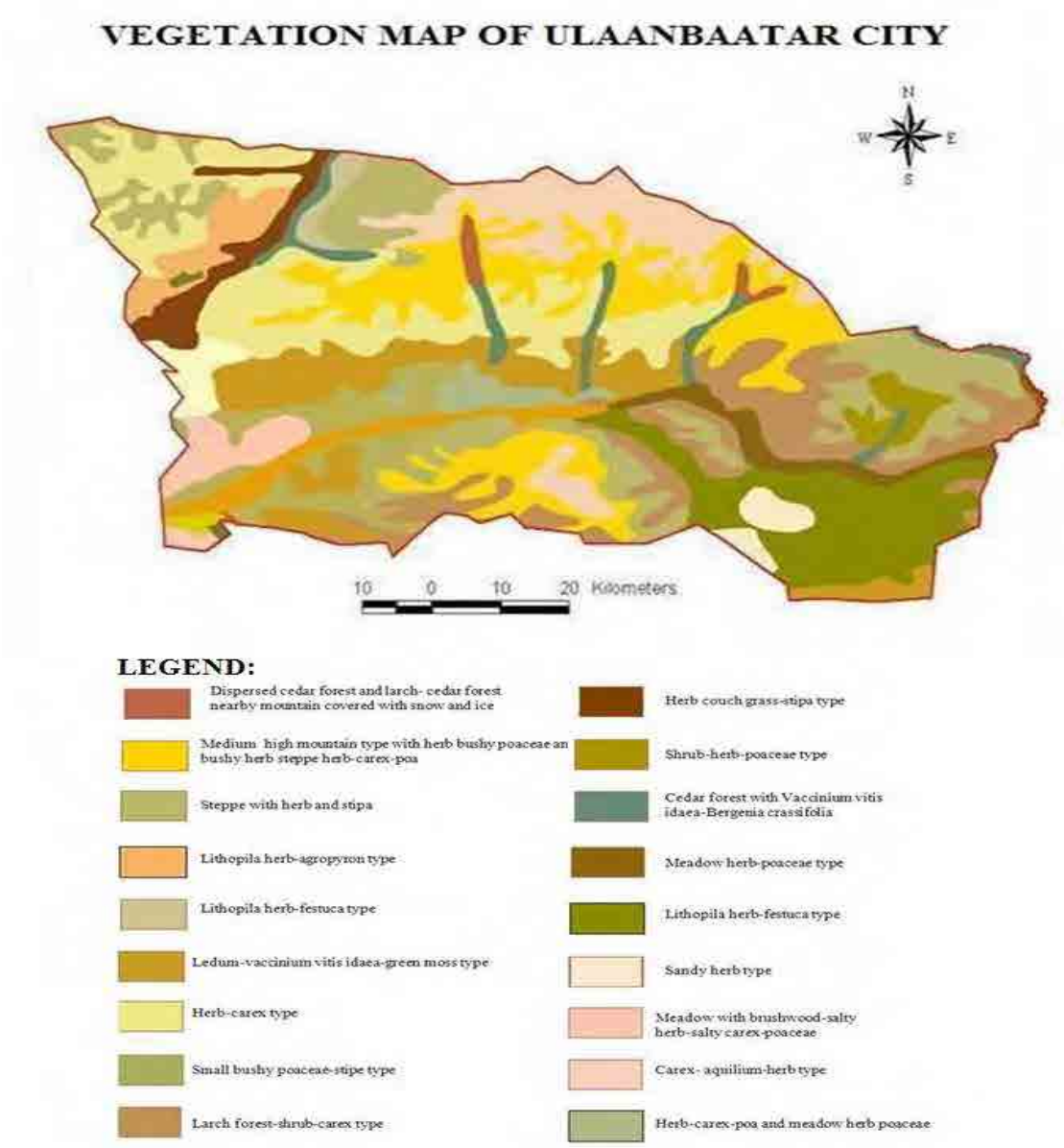


Figure 35. Vegetation cover of Ulaanbaatar city

Type of hidden seeded plants:

Gramineae
Agropyron aegiopoides Drob.
Chenopodiaceae
Chenopodium urbicum L.
Rosaceae
Potentila nivea L.
Potentila anserinaa L.
Gentianaceae
Gentiana nutans Bge.
Ranunculaceae Juss.
Pulsatilla Bungeana
Labiatae Juss.
Dracocephalum foetidum Bge.
Liliaceae

Class of double seeded vegetation:

Thymus serpyllumus
Solanaceae Hall.
Hyoscyamus niger L.
Scropulariaceae Lindl.
Cymbaria dahurica L.
Rubiaceae Juss.
G. verum L.
Leontopodium campestre R. BP.
Achillea asiatica L.
Artemisia frigida Willd.

Two key points were chosen in the surveillance area and complete records of plant species have been done based on the division into two areas.

Figure 36. Eastern part of railway of Dund River

Figure 37. Western part of Dund river

Record 1. August 7, 2012

Outlook: An area along the railway was greatly deteriorated. The main vegetation are weed, straw, nettles, cumin and plantain. The vegetations that were blooming during the surveillance are weed, feather grass, steppe wheat grass, plantain.

Figure 38. Plantain

Figure 39. Bind wood

Figure 40. Nettle

Figure 41. Straw

Record 2. August 7, 2012

The watercourse of the Dund river and riverside meadow is contaminated by flammable materials and lubricants as it is located close to domestic waste disposals, railway and auto road.

Prevailing plants in this area are fat-hen, weed, bushes, elm and dracocephalum foetidum (latin).

Figure 42. Dracocephalum foetidum

Figure 43. Saussurea

Figure 44. Wild onion and cumin

Figure 45. Carex pediformis

During the surveillance no rare and endangered plant species have been observed in the project area and in its immediate area.

The project area is located in the area with poor bio species and thus this is due to prior constructed railway and road infrastructures. Proposed construction of Flyover bridge and its access roads will not be adversely affect the vegetation cover in this area, as current vegetation cover status is needed to be recovered.

3.2.2 Protected Areas

Protected areas of Mongolia are divided into 4 categories: Strictly protected area, national park, natural reserve, and natural monument.

Classification and number of protected areas and percentage of special protected area within the land network and territory of Mongolia is shown in Table 16.

List of special protected areas is shown as per June 2011.

Table 16. Classification and size of protected areas of Mongolia

PROTECTED AREAS					
№	Classification of protected areas	Number of protected areas by classification	Size of area (in ha)	Percentage of protected area within network	Percentage of total territory of Mongolia
1	Strictly protected area	14	11,492,123	45.49	7.35
2	National park	25	11,378,068	45.04	7.27
3	Natural reserve	24	2,259,154	8.94	1.44
4	Natural monument	10	133,176	0.53	0.09
	Total	73	25,262,521	100.00	16.15

In 2012, the number of protected area was increased in all categories and 17% of the overall territory of Mongolia was taken under state protection.

There are three protected areas are located within the territory of Ulaanbaatar city, where the feasibility study on Ajilchin Flyover Project is ongoing. Bogd Khan Strictly Protected Area and Khan Khentii Strictly Protected Area and Gorkhi Terelj National Park.

Among these areas, the national park of Bogd Khan Strictly Protected Area is the closest to the project implementation area.

3.3 Environmental quality

3.3.1 Air Quality

Air pollution is the main challenge to air quality of Ulaanbaatar city. High concentration of human population and highest in Mongolia power-energy production as well concentration of vehicles contribute in production of toxic smokes and substances causing huge negative impact to human health and socio-economic development.

Three combined heat and power stations, over 200 steam boilers, more than 1,000 boilers and over 140,000 ger furnaces produce smoke in Ulaanbaatar from burning coal during the winter season and causes a major negative impact to health of the inhabitants.

The main air polluters e.g. sulfur dioxide, nitrogen dioxide, dust and smaller dust particles are required a special attention for reducing.

Besides the issues mentioned herein above, an increase of vehicle owners and growth in population are becoming the serious issue for Ulaanbaatar in terms of air pollution and traffic jam. A study was carried out on air quality within the Ajilchin Flyover project area to define status in relation to Mongolian air quality standard (MNS4585).

Within the expanded survey on air quality, the air samplings have been taken simultaneously in five locations within 24 hours, in order to define daily status of main

polluters. Locations are nearby Railway Fire Station, Passenger's Wagon Depot, at Dundgol Railroad Bridge, Southeastern corner of Gobi Factory in Khan-Uul District, and on the east of Ajilchin intersection (refer to Table 17 and Figure 46)

This survey started at 11 AM on July 2 and completed on 08.30 AM on July 3, 2012.

While measuring the contaminating substances e.g. sulfur dioxide, nitrogen dioxide, large particle dust, carbon monoxide and lead contents, the weather parameters like air temperature, atmospheric pressure, wind speed and wind direction have been measured same time and a visual observation of weather was also carried out.

Locations of sampling points is shown in table 17.

Table 17. Air sampling points info

	Name and location of point	Latitude	Longitude
1	Railway Fire Station	47°54'33.84"N	106°52'32.32"E
2	Railway Passenger's Wagon Depot	47°54'31.10"N	106°52'18.29"E
3	Southeastern corner of Gobi Factory	47°54'13.49"N	106°52'16.68"E
4	Dundgol Railroad Bridge	47°54'22.27"N	106°52'13.41"E
5	East of Ajilchin intersection	47°54'14.33"N	106°51'23.63"E

In order to determine one time content of contaminators with common distribution e.g. sulfur dioxide, nitrogen dioxide at each monitoring point during the observation, the best absorbent per respective substance was chosen and air was absorbed throughout 20 minutes.

Sulfur dioxide was analyzed using tetra-chloro-mercurat method; nitrogen dioxide was analyzed using Griss-Ilyusov wet chemical method.

In addition to this, the content of large particle dust in the air was analyzed by weight method of absorbing it throughout 20 minutes, carbon monoxide content was analyzed by a direct analyzator and the content of lead in the air was analyzed by particle sampling.

Figure 46. Location of the air quality monitoring points

On the days when surveillance was carried out, the onetime content of sulfur dioxide was between 0.004-0.104 mg/m^3, daily content was between 0,009-0,035 mgandm3, and the maximum daily content was 0.104 mg/m^3 near the Railway Fire Station at 11.00 AM. Daily average content was 1.0-1.7 times more than allowed average limit per 24 hours approved by Air Quality Standard but daily average content didn't exceed limit for one time content.

The daily average content of nitrogen dioxide varied between 0.063-0.099 mg/m^{3}and the maximum one time content reached 0.374 mg/m^{3}at 11 am near the Gobi factory.

The daily average content was 1.1-1, 2 times more than the allowed daily average limit per 24 hours approved by air quality standard and one time content was 1, 1-4, 4 times more than the allowed limit for one time content.

The one time content of nitrogen dioxide exceeded allowed limit for one time content in 35% out of all observation and it exceeded 37, 5% near Railway Fire Station, 12, and 5% near the Wagon Depot, 25% near the Gobi Factory, 25% near the Dundgol Railroad Bridge and 75% near the Ajilchin intersection.

The daily average content of the measurement of large particle dust (PM_{10}) varied between 0.053-0.127 mg/m^3 and the maximum one time content was 0.172 mg/m^3 near the Gobi Factory around 23 PM.

PM_{10} was 1, 27 times more than the daily average limit set forth in Air Quality Standard.

The content of large particle dust shows that the onetime content got closer to 0,1 mg/m^3 and exceeded the standard in 52,5% of overall measurement and shows that amount of large particle dust is large.

The results of the measurement carried out at five locations are shown in the pictures below by each contaminating substance.

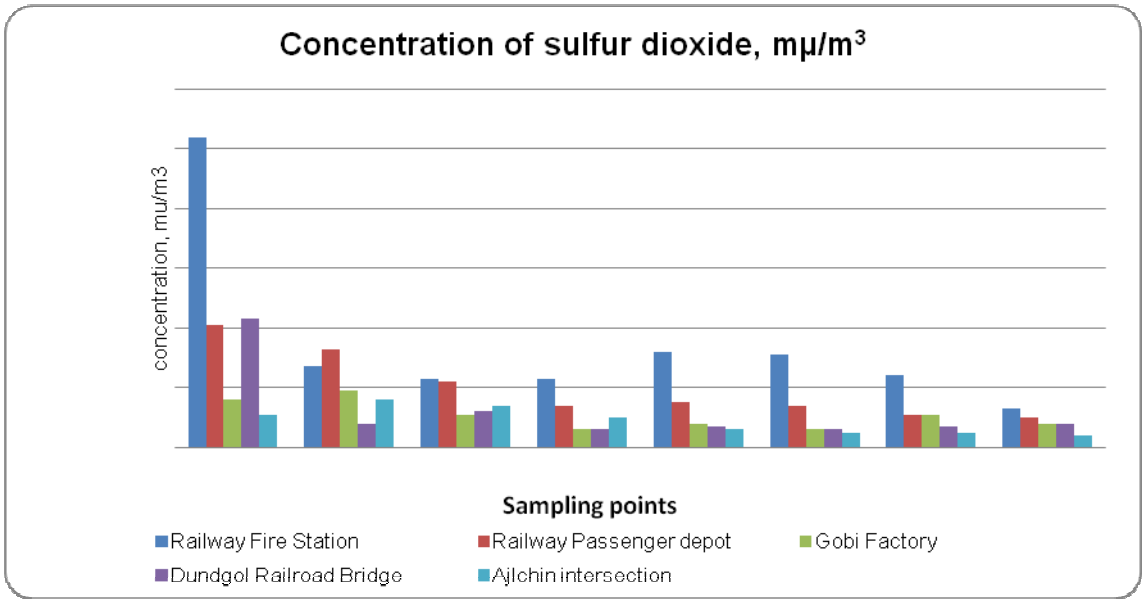


Figure 47. One time content of Sulfur Dioxide

The figure 47 shows that the onetime content of sulfur dioxide was higher near the Fire Station around 11 AM than at other points, but it didn't exceed an allowed limit set forth in Air Quality Standard. Sulfur Dioxide at other points was basically at the same level.

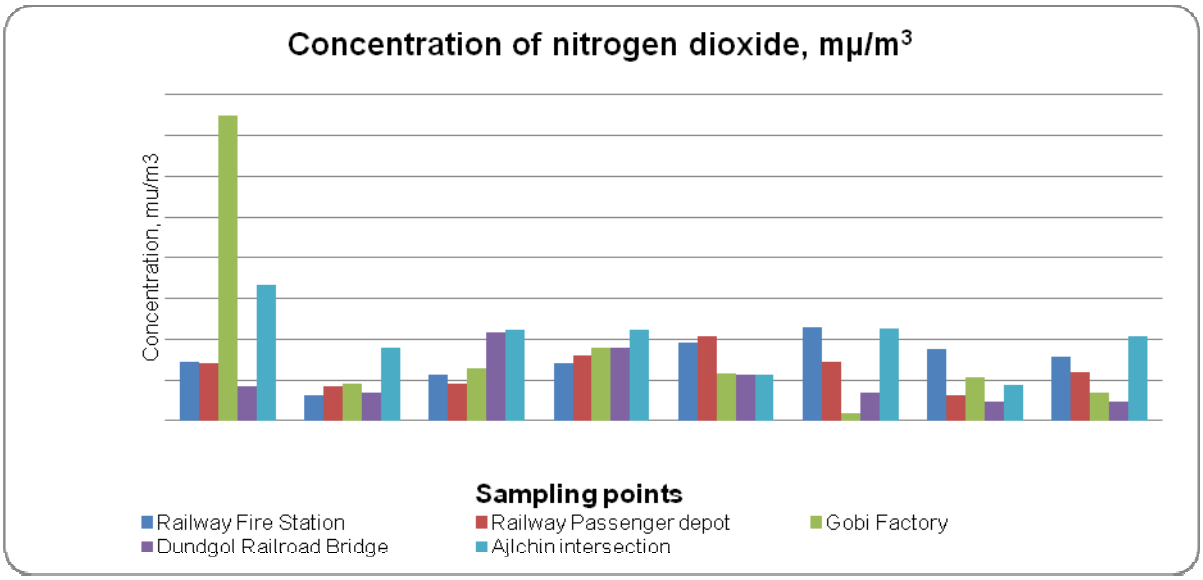


Figure 48. One time content of Nitrogen Dioxide

According to figure 48, one time content of nitrogen dioxide was higher near the Gobi factory at 11 AM than at other points. It was 4, 4 times higher than an allowed limit set forth by Air Quality Standard. Nitrogen dioxide at other points was basically at the same level.

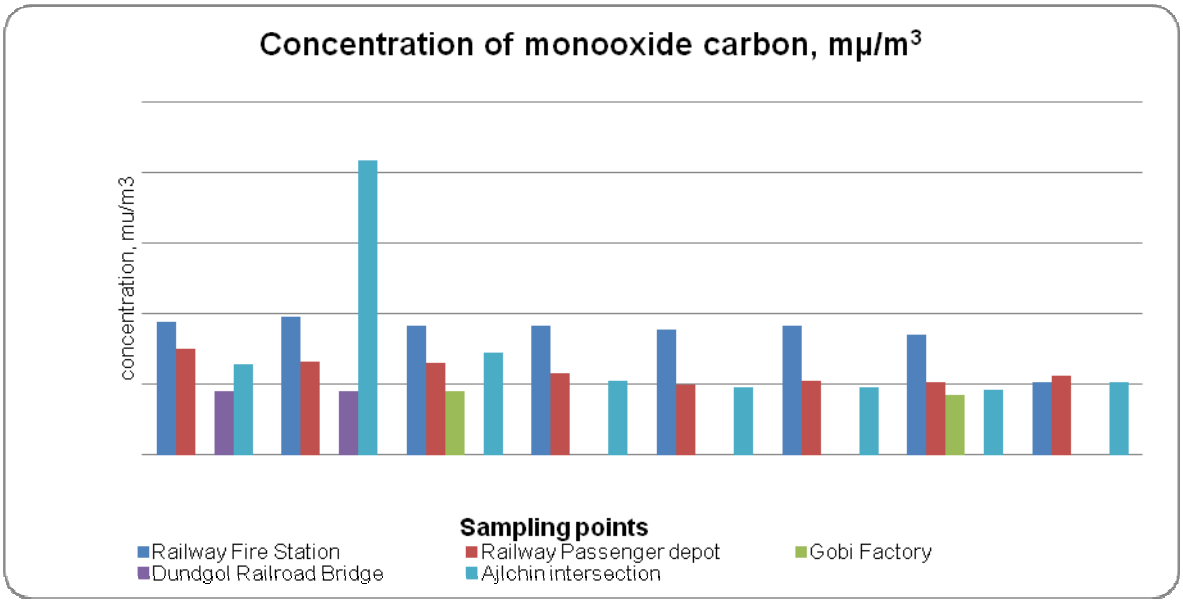


Figure 49. One time content of Carbon Monoxide

According to Figure 49, one time content of carbon monoxide was higher near the Ajilchin intersection around 14 PM than at other points but it didn't exceed an allowed limit set forth by Air Quality Standard. Content of carbon monoxide at other points was basically at the same level.

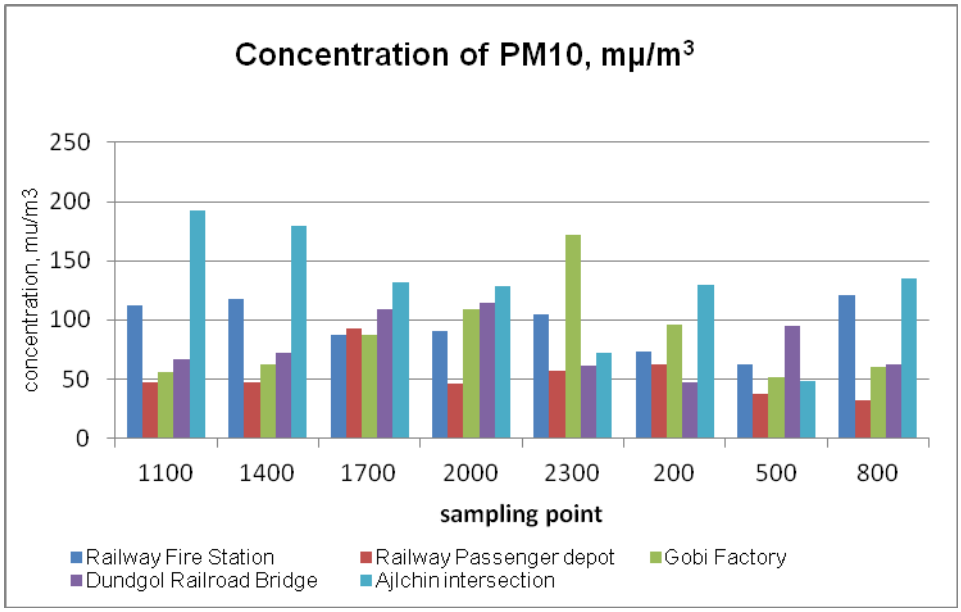


Figure 50. One time content of large particle dust, mkg/m^3

Above graph shows that one time content of large particle dust was slightly higher near the Ajilchin intersection than at other points.

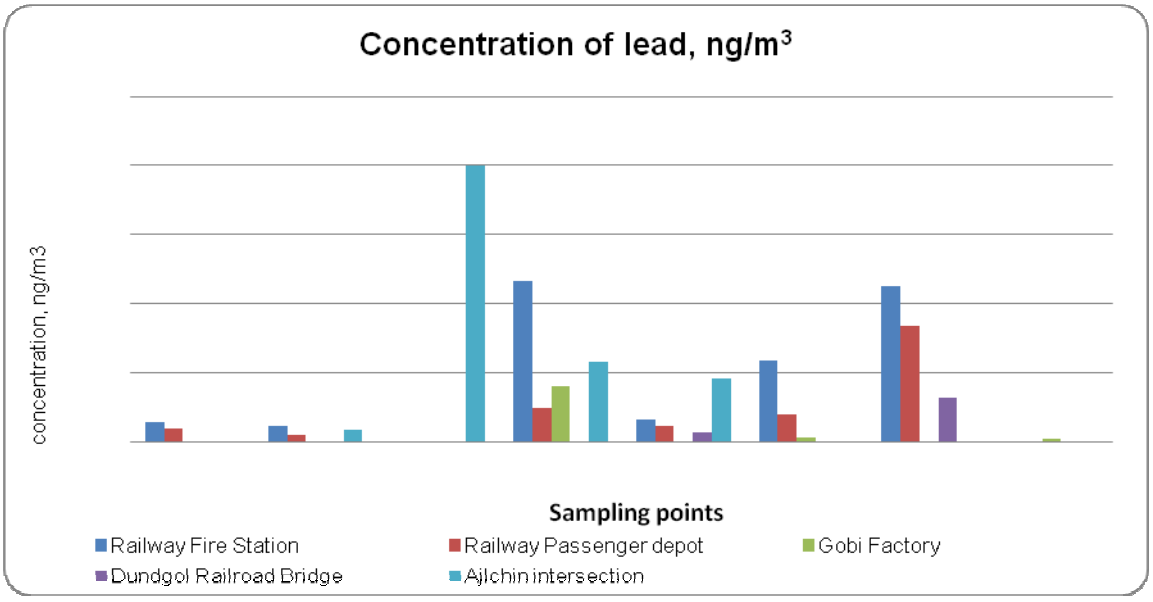


Figure 51. One time content of Lead

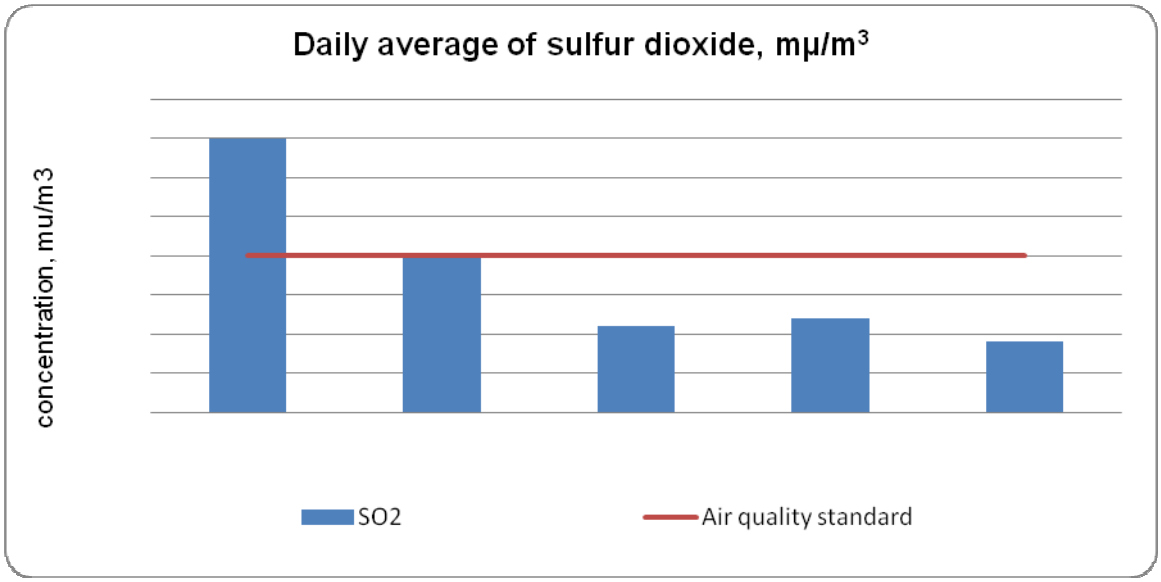


Figure 52. Daily average content of Sulfur Dioxide

The daily average content of sulfur dioxide was 1,0-1,75 times more near the Fire Station and the Passenger's Wagon Depot than the average content per 24 hours set forth by Air Quality Standard and at other points this content was lower than allowed limit set forth by the standard.

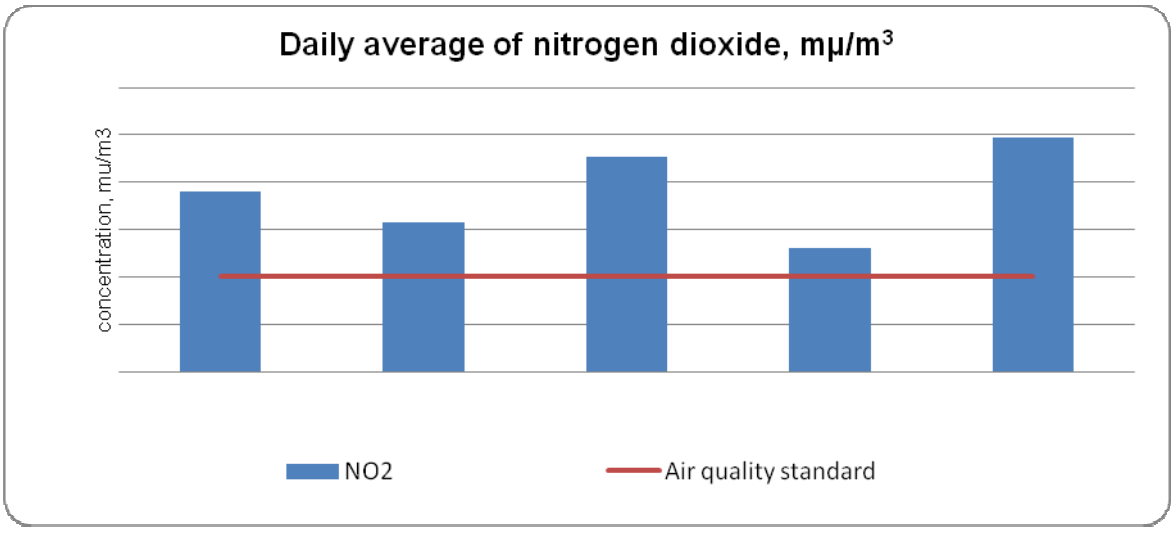


Figure 53. Daily average amount of Nitrogen Dioxide

The daily average content of nitrogen dioxide at all the points was 1,3-2,46 times more than average content per 24 hours set forth by Air Quality Standard.

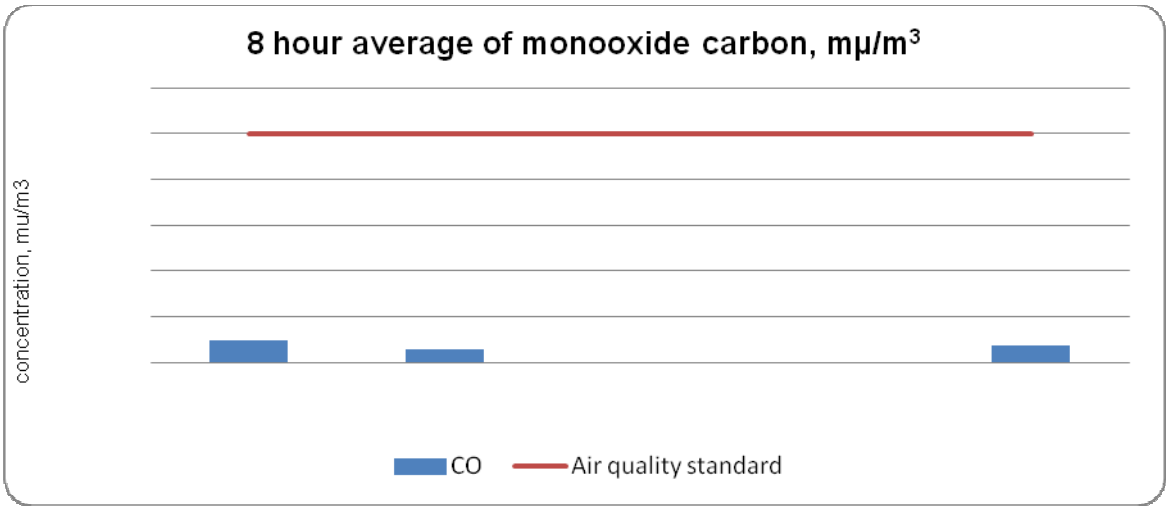


Figure 54. Average content of Carbon Monoxide per 8 hours

The above picture shows that the content of carbon monoxide is within the standard.

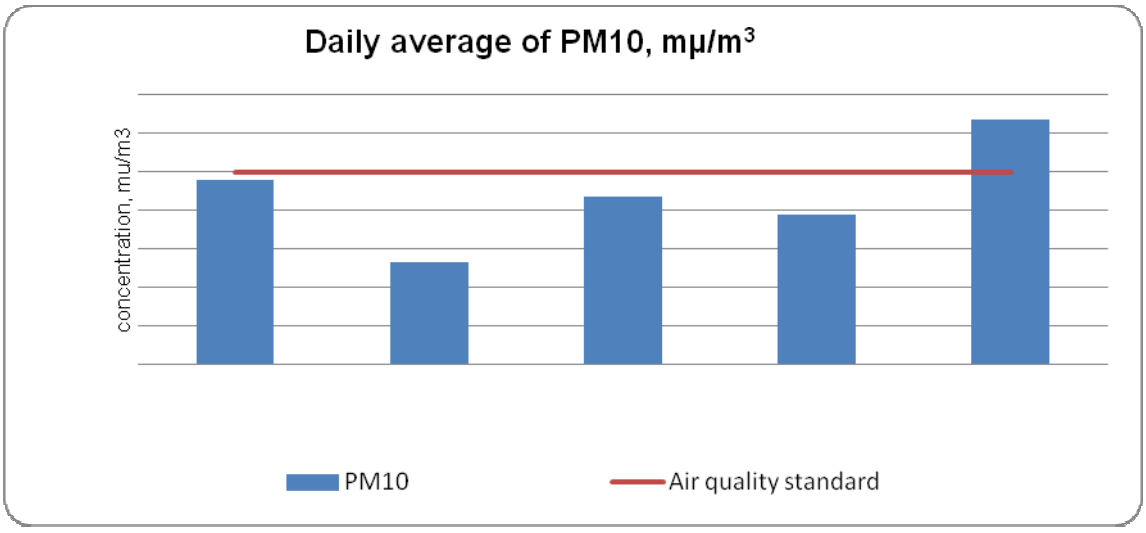


Figure 55. Daily average content of large particle dust

The daily average content of dust near Railway Fire Station, Wagon Depot and Ajilchin Intersection was 1, 27 times more than an allowed limit set forth by Air Quality Standard.

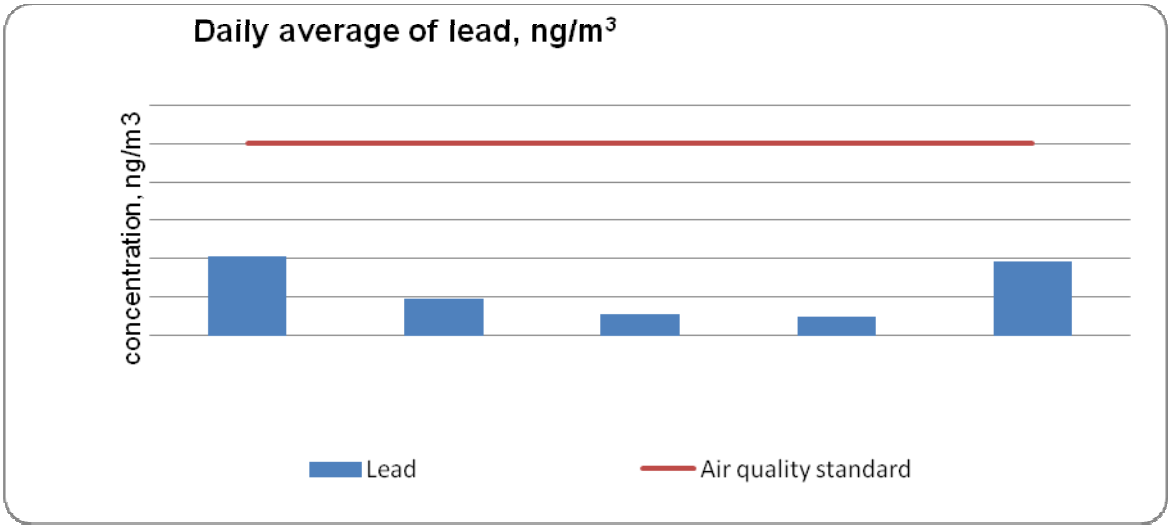


Figure 56. Content of Lead in air

The daily average content of lead in air was within the average content of lead per 24 hours set forth by Air Quality Standard. The content of lead near the Ajilchin intersection and Fire Station was slightly higher than at other points.

Currently, the Wagon Depot and Railroad bridge have low or no traffic at all, but the area near the Gobi Factory; Fire Station and Ajilchin intersection have more traffic. However this traffic is low compared to the traffic of central road and other roads, it is used as shortcut to avoid the traffic jam.

The compiled results of analysis and research show that the onetime content of nitrogen dioxide exceeded an allowed limit in 35% of total observations, and nitrogen dioxide

content exceeded 37,5% near the Fire Station, 12,5% near the Wagon Depot, 25% near the Gobi Factory, 25% near the Railroad bridge and 75% near the Ajilchin intersection.

The daily average content of nitrogen dioxide was 1,1-1,2 times more than an allowed average limit per 24 hours set forth by Air Quality Standard and the one time content was 1,1-4,4 times higher than an allowed limit per one time.

The daily average content of sulfur dioxide at the Fire Station and Wagon Depot was 0,009-0,035mg/m^3 or 1.0-1.75 times more than an allowed average limit per 24 hours set forth by Air Quality Standard.

The content of large particle dust shows the one time content got closer to a daily average allowed limit of 0,1 mg/m3 and exceeded in 52,5% of total measurements and shows that the amount of large particle dust is large.

The content of other contaminators of the air e.g. lead, carbon monoxide was less than the allowed limit or its impacts can be neglected.

Currently negative impacts of contaminators in the project implementation area are exceeding allowed limits of air quality due to frequent traffic jams and low speed of traffic on the street. Projected emission of polluters from vehicles expected to be reduced when Ajilchin Flyover Bridge will be constructed and exploited. The reduction of emission is expected due to reduced traffic jam and increased traffic speed on nearby roads to Flyover project area.

In some areas traffic volume is going to increase compared to current status, when the flyover bridge will be opened. These locations are along Flyover bridge direction around Railway Fire Station and over current railway main railroads. However, current high traffic jams will be reduced (so does air pollution) in other main roads like Peace avenue, Chingiss avenue and Gurvanjin bridge etc.

3.3.2 Noise And Vibration Level

Noise The main generator of noise spread in the environment is caused by various factors e.g. traffic of various transportation means, building and construction, mining and industrial operations. Noise exceeding an allowed limit causes many negative impacts to human health and damages the human hearing and brain cells, affects mental system and becomes sources of fatigue, misconcentration, startling, insomnia and eventually affects the cardio-vascular activity causing high blood pressure, indigestion and poor digestion.

In Mongolia no serious research works was held except some studies of scientists e.g. professors N.Saijaa, N.Tugjsuren, who updated and developed a national normative for noise and professor N.Tugjsuren measured and studied noise caused by vehicles passing through a central road of Ulaanbaatar.

No systematic research that carried our detailed assessment on the noise level around the railway was carried out in the country previously. In some cities the average level of noise along with main road of transportation means was measured. According to this study, average

noise level of Ulaanbaatar is 75, 6 dB, Erdenet 67.1 dB, Darkhan 54, 9 dB, Choibalsan 57, 0 dB.

Assessment method for noise level Hygienic norm on noise, its assessment and frequency schedule are divided to Octavian range.

Octave is a frequency interval between maximum frequency and minimum frequency with double its frequency.

The octave range shall be determined by an average frequency between its minimum and maximum amounts.

$$f = f \text{ min} \times f \text{ max} = f \text{ min} \times 2 f \text{ min} = 2 \times f \text{ min} = 1.41 f \text{ min}$$

The maximum and minimum amounts of frequency to determine the octave range shall be divided into standard frequency amount of $\sqrt{2}$ =1.4142135 and multiplied.

For example, f=1000 Hz is the minimum amount of octave range frequency F_{min}=1000/1.414135=707 Hz, maximum amount shall be f_{max}=1000·1.414135=1414 Hz

But one third (1/3) of the octave interval meaning shall be found by dividing the standard amount of octave zone frequency to $\sqrt[3]{2}$ =1.25 and multiplied.

For example, If we break a whole octave range (1/1) with 500 Hz of standard frequency into 1/3 octaves, it will be 500:1.25= 400 Hz, 500 1.25=625 Hz.

Health norm on noise In order to assess the place with various noises in terms of hygiene, a logarithm level of average square meaning of noise pressure shall be taken as indicator to normalize. This indicator shall be normalized by octave ranges of noise frequency.

In terms of health, the maximum limit for noise which continuous impact the person can take is approved and followed. This maximum limit for noise is similar in many countries of the world (Table 18).

Table 18. Level of maximum limit for noise

Noise duration (in hours)	8	6	4	3	2	1.5	1	0.5	0.25	0.02	0.01
Maximum noise limit, dB	90	92	95	97	100	102	105	110	115	117	120

Negative impacts will be caused to health if person stays more than 8 hours in a place which noise level reaches 90dB and hearing organ will be damaged if stay more than 0, 6 minutes in a place with noise of 120 dB.

Level of noise limit depends on its frequency (Table 19)

Table 19. Relationship of level of noise limit with the frequency

Frequency zone, Hz	63	125	250	500	1000	2000	4000	8000
Level of noise limit, dB	99	92	86	83	80	78	76	74

Mongolian standard (MNS 5002:2000) updated in 2000 is followed as general requirement for noise classification, hygiene specification and norm, noise safety and meeting of hygiene requirements and Mongolian standard MNS 5003:2000 is followed as general requirement for measurement of noise.

Standard MNS 5002:2000 thoroughly determined the amount of constant and inconstant noise level within wide frequency range depending on the workplace requirements.

For example, potential noise level at industrial permanent workplace of our country is set forth as follows (Table 20).

Table 20. Allowed potential constant and inconstant noise level within wide frequency range

Workplace	Noise pressure level (in DB) in octave range with average geometrical frequency (1 Hz)								Average noise level, dB
	63	125	250	500	1000	2000	4000	8000	
Constant workplaces and work zones of the industry, industrial surrounding and workplaces with permanently mounted machinery	99	92	86	83	80	78	76	74	85

Results of noise measurements taken in the Ajilchin Flyover Project territory

Noise measurement points were given in the ToR and the study team has defined exact locations of measurements.

There were selected five points and at the chosen points, the noise level was measured by ENVIRONMET METER 4IN (tool intended for simultaneous measurement of relative air humidity and air temperature), wind speed was measured by an Anemometer and soil temperature was measured by a laser thermometer (Figure 57).

Figure 57. Tools used for measuring of noise level nearby proposed Flyover bridge

Locations of 5 points of measurement are shown in Figure 58.

Figure 58. Location of points where the noise level was measured

Results of measurement and research carried out at chosen points

Maximum, minimum and average amounts of noise in measured areas are shown in Tables 21-23 and the change throughout the day is shown in Figure 58.

Table 21. Noise level at points 1 and 2

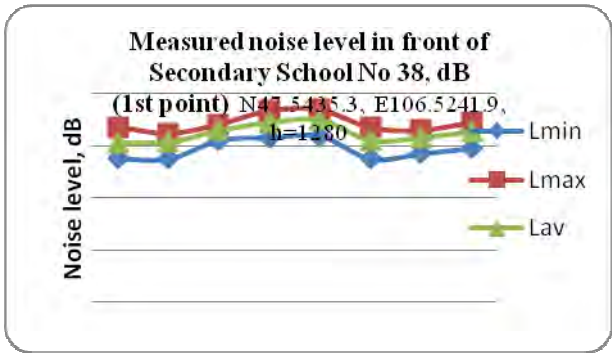
Noise level at I point				Noise level at II point			
T	**L_{min}**	**L_{max}**	**L_{av}**	**T**	**L_{min}**	**L_{max}**	**L_{av}**
2:00	55.2	67.3	61.2	2:00	60.6	91.3	62
5:00	55	64.7	61.5	5:00	60	76.7	65.5
8:00	62	68.3	66	8:00	70	77.9	72.6
11:00	63	73.7	69.1	11:00	66	76.8	71.5
14:00	63.6	74	70	14:00	70.4	82	75.5
17:00	55	66.9	62.1	17:00	83	104	84
20:00	57	66	63.3	20:00	77	98.3	82
23:00	59	69	65.5	23:00	72.8	82.7	74
Average	58.73	68.74	64.84	Average	69.97	86.21	73.38
Maximum	63.6	74	70	Maximum	83	104	84
Minimum	55	64.7	61.2	Minimum	60	76.7	62

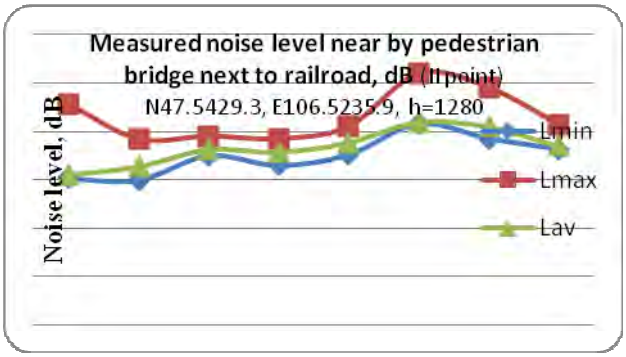
Table 22. Noise levels at points 3 and 4

Noise level at III point				Noise level at IV point			
T	L_{min}	L_{max}	L_{av}	T	L_{min}	L_{max}	L_{av}
2:00	56.4	65.1	62	2:00	57.9	62.8	61.1
5:00	55	62.3	60.1	5:00	63	76.1	69.2
8:00	64.9	70.4	68	8:00	68.2	72.3	70
11:00	60.3	65.6	63.3	11:00	63.5	72	66
14:00	68.4	72.3	71	14:00	62	67	63
17:00	67	77	72	17:00	69	91	79.1
20:00	61.4	77	69	20:00	67.2	74.7	70
23:00	63	72	68	23:00	62	74	68
Average	62.05	70.21	66.68	Average	64.1	73.7	68.3
Maximum	68.4	77	72	Maximum	69	91	79.1
Minimum	55	62.3	60.1	Minimum	57.9	62.8	61.1

Table 23. Noise levels at point 5

T	L_{min}	L_{max}	L_{av}
2:00	63.5	74.4	67.3
5:00	64.8	66.6	64.6
8:00	65.1	72.2	68
11:00	62.9	73	66.3
14:00	71.7	78.2	71.3
17:00	69	89	73.2
20:00	64	76	70.3
23:00	63	72	68
Average	65.86	75.18	68.63
Maximum	71.7	89	73.2
Minimum	62.9	66.6	64.6





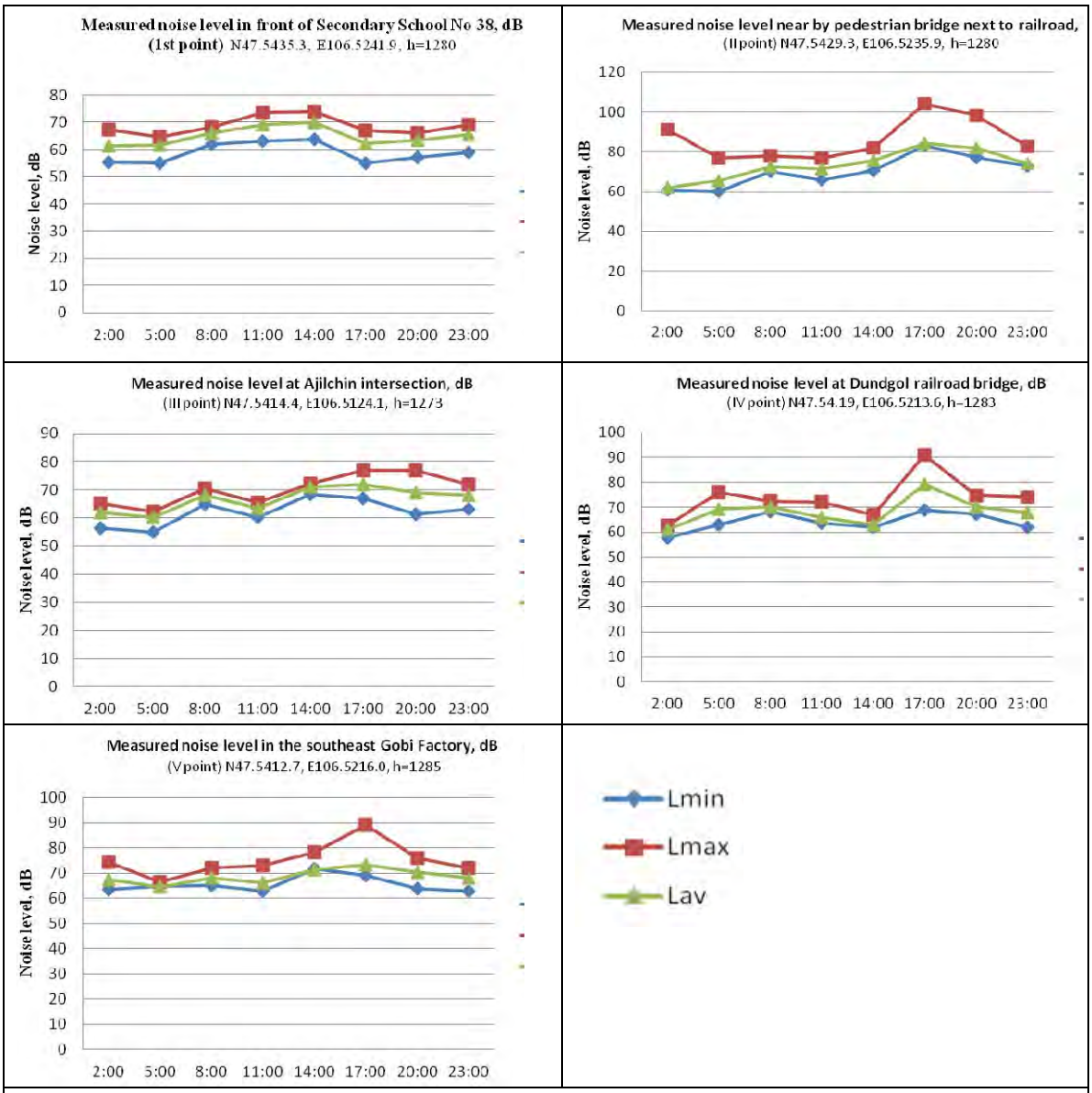


Figure 59. Noise levels measured in five points in the Flyover project territory (by each of 5 points)

Compiled results of the analysis are shown herein below.

1. The ranges of maximum and minimum amounts of noise at the points chosen nearby the overhead bridge are shown in Table 24 and daily average of maximum, minimum and average amounts of the noise is shown in Figure 60.

Table 24.The change range of maximum and minimum levels of noise at all points

Points of measurements	Range of maximum amount of noise, dB	Range of minimum amount of noise, dB	Range of average amount of noise, dB
I point	64.7-74.0	55.0-63.6	69.9
I I point	76.7-104	66.0-83.0	73.4
III point	62.3-77	55.0-68.4	66.7
IV point	62.8-91.0	57.9-69	68.3
V point	66.6-89.0	62.9-71.7	68.6

The maximum amount of noise reached 91 dB and 104 dB at the points I and II and records were taken when locomotives signaled and its recurrence is rare.

On the other hand, the maximum noise appears in period of 17-20 PM and it can be considered that created noise level is related to nearby railway operations.

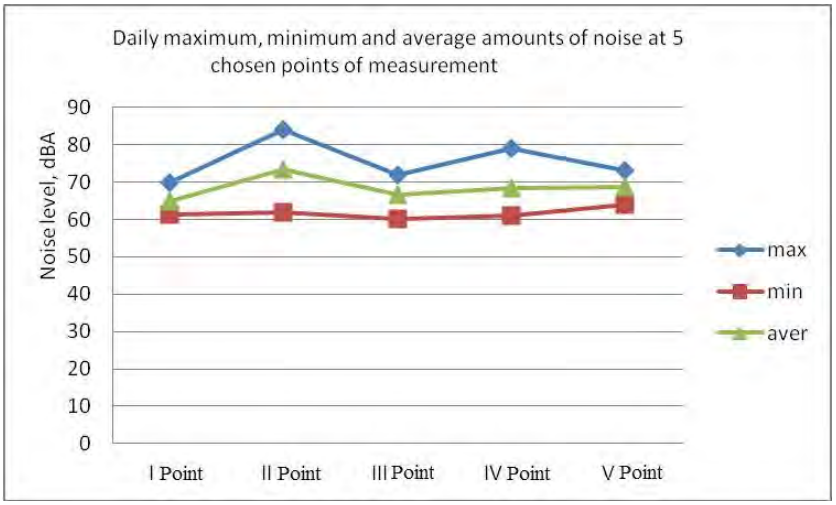


Figure 60. Daily maximum, minimum and average amount of noise at the points of measurement

1. Average changing range of maximum amounts of noise nearby Flyover project is 62.3-104.0 dB per day, changing range of minimum amount of noise varies between 55.0-83.0 dB and average changing ranges of manximu and minimum amounts are 74.80 dB and 64.13 dB respectively. There are no large scale permanent inhabitants in this area except 27 households living within 50 m range from Ajilchin intersection (Point III).

   In general, it is considered that no substantial negative impact from noise nearby Flyover project will be caused to human health as average daily amount of noise nearby Flyover project area is 69,38 dB. If refer to World Health Organization's guidance, it states that 70 dB of noise throughout 24 hours nearby industry, public service facility and auto road in settlement area will not cause negative impact to human health.

2. Further tendency of noise level will depend on intensification of vehicle flow that passes through this Flyover bridge . Once Flyover project is completed, traffic volume will be reduced in surrounding roads and traffic is expected to increase on Narny road and Ajilchin intersection. Given that traffic volume and speed will be changed when FLyover will be constructed, it would be appropriate to establish monitoring points for noise control.

Vibration

Vibration measurements have been conducted for identification of major sources of vibration as well as levels of vibration at current situation and future time, when the Ajilchin Flyover Bridge will be built.

Measurement is held throughout 24 hours in every 3 hours from 15.00 pm July 2, 2012 to 12 pm July 3, 2012 at 5 points where noise measurement is carried out (in front of school#38, nearby pedestrian bridge next to railroad, Ajilchin intersection, and Dundgol River railroad bridge, southeast corner of Gobi Factory).

The results of measurement carried out in every 3 hours throughout 24 hours are shown in Table 26.

The vibration level at the chosen points were measured by RIOVIBRO Vm-63/ Pocketable vibration meter and relative moisture and temperature were measured by Temp & Humidity Meter PCE-MHT1 and wind speed is measured by anemometer and PCE-MAM1.

Figure 61. Vibration was measured by a sensor at the surface level, where vibration is coming

Figure 62.Vibration measurement tools

Figure 63. Transportation means –a source of vibration

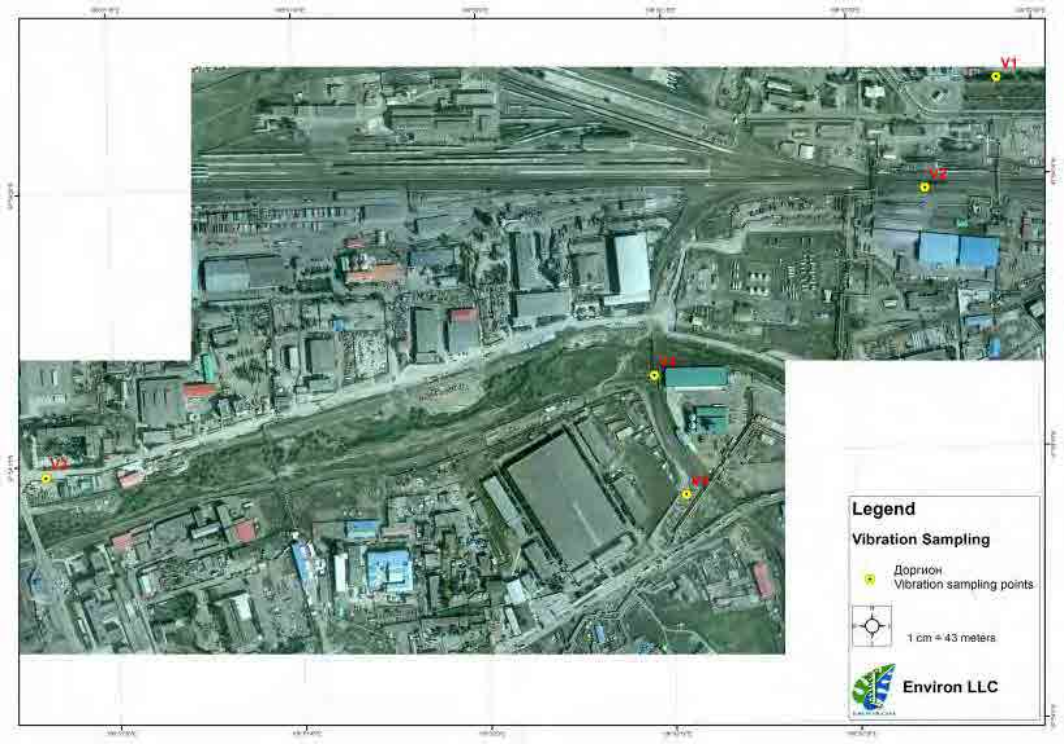


Figure 64. Location of vibration measurement points

The results of vibration measurement taken at 5 points are shown in table 25.

Table 25 Vibration measurement results of selected five points in the project area.

Measurement info	Measurement time (24 hours)							
Point 1 (Secondary school #38)	**15.00**	**18.00**	**21.00**	**00**	**03**	**06**	**09**	**12**
Hi m/cm^2	0.04	0.01	0.02	0.03	0.1	0.02	0.02	0.02
1 kHz/z cm/s	0.21	0.03	0.02	0.02	0.01	0.02	0.02	0.02
Low mm	0.015	0.014	0.015	0.003	0.003	0.005	0.003	0.004
Point 2 (pedestrian bridge)	**15.40**	**18.40**	**21.40**	**00.40**	**03.40**	**06.40**	**09.20**	**12.20**
Hi m/cm^2	0.04	0.04	0.02	0.03	0.07 Train passed	0.17 Train passed	0.21 Train passed	0.12
1 kHz/z cm/s	0.11	0.05	0.02	0.03	0.070	0.27	0.08	0.02
Low mm	0.021	0.014	0.029	0.004	0.003	0.121	0.015	0.011
Point 3 (Ajilchin intersection**)**	**16.00**	**19.00**	**22.00**	**01.00**	**04.00**	**07.00**	**10.00**	**13.00**
Hi m/cm^2	0.03	0.02	0.04	0.04	0.01	0.02	0.02	0.02
1 kHz/z cm/s	0.01	0.04	0.04	0.04	0.01	0.02	0.01	0.02
Low mm	0.007	0.014	0.019	0.004	0.003	0.003	0.005	0.004
Point 4 (Dund River Railroad Bridge)	16.20	19.20	22.20	01.20	04.20	07.20	10.20	13.20
Hi m/cm^2	00.2	0.02	0.01	0.02	0.02	0.17 Train passed	0.02	0.02
1 kHz/z cm/s	0.04	0.02	0.01	0.02	0.02	0.06	0.01	0.01
Low mm	0.005	0.003	0.003	0.003	0.003	0.005	0.005	0.005
Point 5 (Southeast of Gobi Factory)	**16.25**	**19.25**	**22.25**	**01.25**	**04.25**	**07.25**	**10.25**	**13.25**
Hi m/cm^2	0.01	0.01	0.03	0.02	0.01	0.01	0.02	0.01
1 kHz/z cm/s	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.02
Low mm	0.007	0.003	0.011	0.003	0.003	0.004	0.004	0.004

There is no study and respectively no standard or norms are set for the vibration in Mongolia. The normative document “SN2.2.4/2.1.8.566-96 – Vibration level at Industrial, Apartment Buildings and Public Facilities” of the Russian Federation was used for this assessment.

Average geometrical frequency within the octave plane for accommodation and public facility was taken by 2,4,8,16,31,5,63 Hz for assessment of general vibration.

Table 26. Weather parameters at the measurement points

Measured time	**V** Wind speed	**T** Air temperature	**T** Soil temperature	**B %** Relative air moisture
15:00	0,7	11.6	8,1	54
18:00	0,8	10,68	7.1	62
21:00	1,1	17,22	13.5	41
12:00	2,3	22,3	25	28

Measured time	**V** Wind speed	**T** Air temperature	**T** Soil temperature	**B %** Relative air moisture
03:00	2,78	23,8	28.6	33
06:00	3,5	22,1	23.4	26,2
09:00	1,1	2 0.9	20.2	23,2
12:00	0,3	17,25	11.6	45,4

Average square quantity of speed (V) and vibration accelerator were measured by sum calculated in octave plane of their logarithm level (Lv, La 1/1, 4).

The results of carried out measurements show that among five chosen points, the vibration level on the point No2 (next to main railroad) and on the point No4 (Southeast corner of Gobi Factory) was higher than the other points when vibration was measured during passing of train with 5-20 freight wagons.

In total of 120 measurements have been taken 8 times in every 3 hours throughout 24 hours and the maximum level of vibration was recorded when trains passed through.

But vibration level was low when heavy duty trucks and vehicles passed. We compared high results of vibration measurement with permitted hygiene norms of Russia and those high results of vibration do not exceed the permitted limit.

The vibration will likely to increase further and general vibration is likely to impact the health of inhabitants of buildings and public facilities along the flyover bridge, when it will be in exploitation. Therefore, vibration caused by transportation means and industrial operations through passing the Flyover bridge should further be recorded constantly and monitored so that not to interfere human population nearby and passengers of the vehicles.

Thus, proposed Flyover project will not produce vibration that will be harmful for surrounding human population and environment.

3.3.3 Surface Water Quality

In accordance with the ToR, water sampling were taken at three locations along the Dundgol River flow: upstream middle and downstream within the territory of proposed Ajilchin Flyover Project (Figure 69). Water quality parameters e.g. pH, electrical conductivity-EC, total dissolved solids-TDS of Dundgol River have been measured on the sites, when sampling took place.

General chemical composition of water samples was analyzed in the Water laboratory of Institute of Geo Ecology of Mongolian Academy of Sciences. Heavy metals content of these samples were analyzed in the Central Geological Laboratory. Results of laboratory analysis are in Attachment 9

The results of analysis are described below:

1. According to chemical composition, the first sample belongs to fresh and soft water of 2nd type of hydro carbonate and calcium group. This water belongs to ''Contaminated'' classification of classification norm of surface water clarity level.

The river water had lots of dirt, grass, vegetation and gulfweed. It was brown in color and had turbidity.

Figure 65. The first location of sampling at Dund river

2. According to chemical composition of second location of sampling, it is fresh and soft water of 2nd type of calcium group and hydro carbonate class. This water belongs to ''Contaminated'' classification of classification norm of surface water clarity level.

Figure 66. Second location of sampling

3. According to chemical composition of third sampling location the water belongs to fresh and soft water of hydro carbonate class, calcium group of 2nd type. This water belongs to ''Contaminated'' classification of classification norm of surface water clarity level.

Figure 67. Third location of sampling

In addition to chemical composition analysis, content on sulfur was analyzed for all three samples and no sulfur was identified in all the water samples.

According to compiled results of the samples, surface water mineralization is 230 mg/l, solidity is 2.5 mg-eq/l, the anions have $HCO_3^->Cl^->SO_4^{2-}$ structure and cations have $Ca^{2+}>Na^++K^+>Mg^{2+}$ structure.

To note that water quality and composition of all 3 samples are similar. Therefore, we consider that bridge construction area shall be chosen based on hydrological conclusion and other relevant factors.

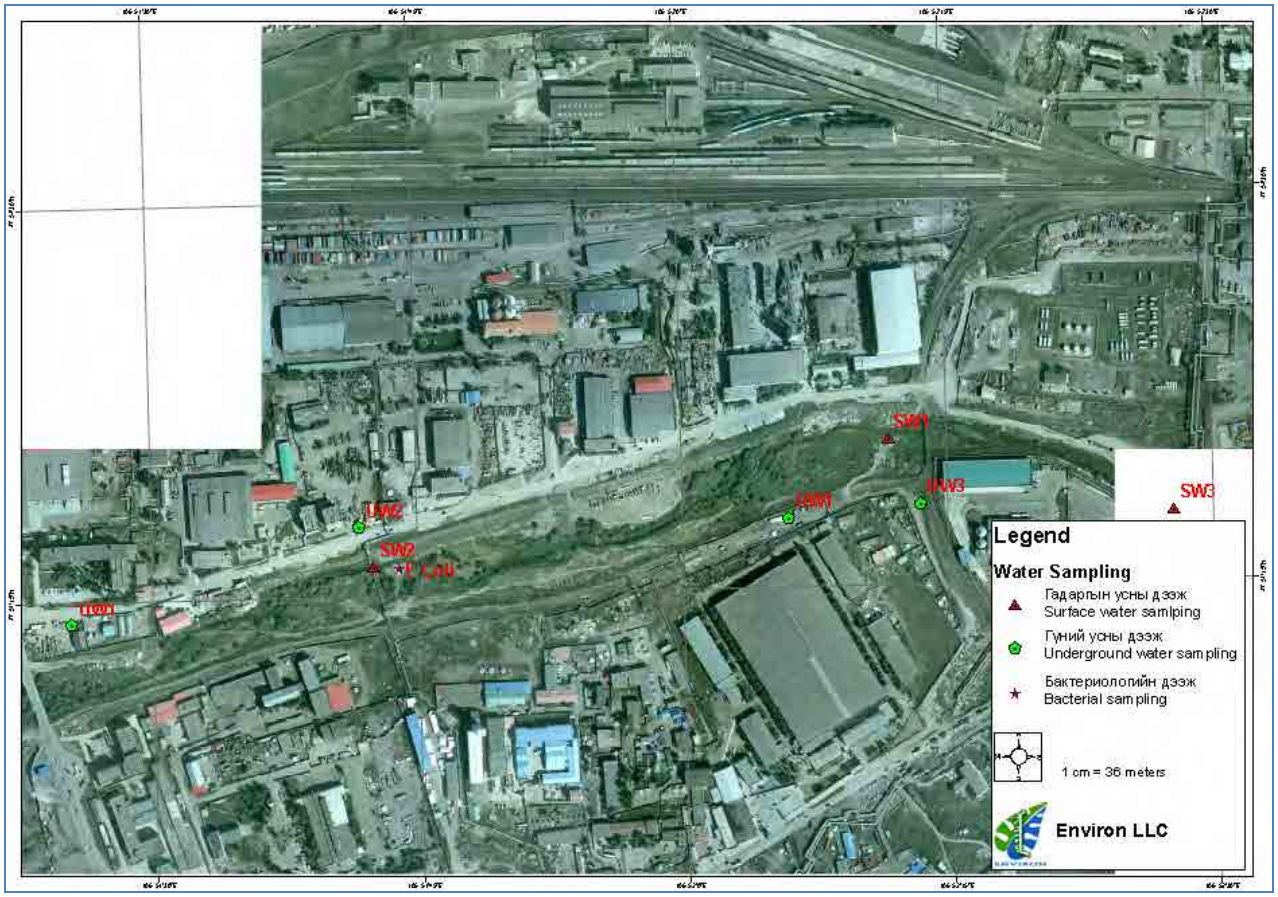


Figure 68. Location of surface and ground water sampling points

Bacterial Contamination Level of Surface Water

In order to identify bacterial status of Dundgol River, water sample was taken from Dund River at coordinate 47^0 54’ 16” N, 106 51’ 44.1” E (Figure 69). Sampling was taken according to the method of bacterial analysis and analyzed in Laboratory of National Public Health Center of Ministry of Health of Mongolia.

The bacterial analysis on delivered sample was carried out by standard methodology by 4 parameters and hygiene assessment was given compared to Mongolian National Standard of Drinking Water (MNS 900-2005), Water Quality, microorganism of intestinal (entro) group, microorganism adapted to heat, identification and counting of suspected intestinal E-coli (MNS 4697-98), identification and counting of suspected anaerob

microorganisms CI.perfringens (MNS 7939-2000), identification method (MNS6340-2003) for identification of water quality- salmonella.

The results of one time bacterial analysis carried out on samples taken from Dund river water don't meet the Mongolian standard requirements mentioned herein above.

The results of bacterial analysis are shown in Table 27.

Table 27. The results of bacterial analysis carried out on water sample taken from Dund river

Specification	Number of bacteria	Microorganism of entro-group	Anaerob microorganism	Pathogens of entrogroup
Name of standards followed	MNS 900-2005	MNS 4697-98	MNS 7939:2000	MNS 6340-2003
parameters shown in standard	100	0	Not identified	Not identified
Content within the sample	5×10^4	*E. coli*is identified	*Cl.perfringens* is identified	No pathogens are identified

Therefore, Dund river water shouldn't be used for drinking and domestic/household purposes. Water quality and safety shall be always followed up and monitored.

3.3.4 Ground Water Quality

The samples for analysis of ground water quality are taken from three locations within the project area and analyzed at water laboratory of Geo Ecological Institute and content of heavy metals within these samples was analyzed at Central Geological Laboratory.

1. Water from well in the fence of Ilch Khangai LLC was analyzed for ground water quality. According to chemical composition, it is fresh and soft water of hydro carbonate class and calcium group of 2nd type.
   The analysis results of this water meet the requirements of Standard for Drinking Water MNS900:2005.

Figure 69. Well of Ilch Khangai LLC for domestic use

2. Water of sample taken from the second location is fresh and smooth water of hydro carbonate class and calcium group of 2nd type according to its chemical composition.

   The analysis results of this water meet the requirements of Standard for Drinking Water MNS900:2005.

Figure 70. Second location of ground water sampling

3. There is one fragile area within the proposed Ajilchin Flyover project territory, where 23 households with 76 peoples live in a public house, owned and managed by a private person. All contingents of this house use a deep water well to meet their water demand. The third water sample was taken from this well to see if the water consumed meets drinking water quality standard. According to chemical composition, it is fresh and hard water of hydro carbonate class and calcium group of 3rd type. Lab result shows ammonia ion content in water exceeds the tolerable level indicated in the Drinking water standard MNS900:2005. Therefore, water is not so suitable for drinking. One would need to filter and soften in case of consumption.

Figure 71 Location of third sampling point for underground water quality

In terms of heavy metal content, no sulfur was identified in all underground water samples.

The underground water samples have 410 mg/l of mineralization, 4.9 mg-eq/l of solidity, anions have HCO_3^-> SO_4^{2-}> Cl^-structure and cations have Ca^{2+}> Mg^{2+}>Na^++K^+ structure.

Impact of surface and ground water composition to concrete mixture

Concrete mixture used for building and construction is commonly affected to deformation due to water used for mixture and corrosion of surface and ground water after performance of construction.

Corrosive impact of water is related to water environment pH and carbon, sulphates and magnum ion effects.

The following results are seen during comparison of standard and corrosive impacts of water sampling points involved in research with maximum limits.

According to analysis results, the corrosive impact of surface and ground water to concrete mixture is low and samples meet the requirements of ''Standard of water UST 3821-85 used for concrete and construction'' followed in Mongolia.

Table 28. Compiled results of corrosive impact analysis of water points

Specification	Measurement unit	Permitted maximum level	River water	Soil water
Chloride	mg/l	500	24.8	22
Sulphate	mg/l	3000	25	70
Substance to be weighed	mg/l	50000	29.7	0.0
Alkalinity	mg/l	600	44	44
Corrosive CO_2	mg/l	<3.4	2.75	0.7
Water environment pH	-	>5.5	7.97	7.41

3.3.5 Soil quality

Soil contamination in areas along the Ajilchin Flyover Trace. The mixed samples were taken from areas covered with domestic waste and various dumps to define soil contamination level and content of heavy metals.

Mixed soil sample-1. Soil section was done in the garden area to the north of Railway Central Station, preserving its natural look in order to compare the change and contamination of soil along the project trace covered with domestic wastes.

Figure 72. Soil sampling process

Contamination samples were taken from 0-7 cm of topsoil at 10 different points of respective area, those 10 samples were thoroughly mixed and one sample was prepared and marked as X-1 sample.

According to results of laboratory analysis of heavy metal content of soil taken from the garden located to the north of Central Railway Station, Cr (chrome) is low (49) or within an allowed limit (150) of the soil set forth in standard MNS 5850:2008, Cd (cadmium) is very low (<0.005) or lower than (0.01-2.0) an allowed limit set forth in standard, As (Arsenic) is low (18) or within an allowed limit (0.1-40) set forth in standard, Hg (mercury) is low (0.15) or within an allowed limit (0.01-0.85), Pb (lead) is low (45) or within an allowed limit (2-300) set forth in standard.

Mixed soil sample-2.

Sample X-2 was taken in the south of railway Passenger's Wagon Depot in a thin hollow area. This hollow area is full of domestic wastes e.g. trashes and plastic bags.

We took 10 samples from 7 cm depth of 10 areas of this contaminated area and prepared a mixed sample.

Figure 73. Mixed sample (X-2) is prepared from hollow area in south of Railway Wagon Depot

According to the results of laboratory analysis of heavy metal content in soil of hollow with wastes in south western part of railway station, content of Cr (chrome) is low (68) or within an allowed limit (5-1500) set forth in standard MNS 5850:2008, content of Cd (cadmium) is very low (<0.005) or within an allowed limit for soil (0.01-2.0) set forth by MNS 5850:2008,

content of As(arsenic) is low (11) or within an allowed limit (0.1-40) of soil, Hg(mercury) is low (0.19) or within an allowed limit of (0.01-0.85) standard, Pb (lead) is very low (27) or within an allowed limit for soil (2-300) set forth in standard.

Mixed soil sample-3. The sampling location is in between the Dundgol River and West Industrial Road next to Wagner Asia LLC. As with previous sampling point, the area dumped with various solid wastes. Soil sample X-3 was taken here in order to check soil contamination status.

Figure 74. Sampling location of mixed soil sample-3

According to results of laboratory analysis that determined heavy metal content in this soil sample, content of Cr (chrome) is low (40) or within an allowed limit (5-1500) set forth in standard, Cd(cadmium) is very low (<0.005) or within an allowed (0.01-2.0) set forth in standard, As(arsenic) is very low (7) or within an allowed limit (0.1-40) set forth in standard, Hg(mercury) is low(0.19) or within an allowed limit (0.01-0.85) of standard, Pb (lead) is low (62) or within an allowed limit (2-300) set forth in standard.

Mixed soil sample-4. Soil sampling area is located in between the Dundgol River and West Industrial Road next to Suuri LLC. Elevated waste of dam along with river watercourse is cut and dug in order to install cable line. This area has average vegetation and we prepared mixed soil sample X-4 by choosing an area with compacted and exposed soil.

Figure 75. Sampling location of mixed soil sample -4

According to the results of laboratory analysis that determined heavy metal content of this soil sample, content of Cr (chrome) is low (44) or within an allowed limit (5-1500) of soil set forth in standard, Cd (cadmium) is very low (<0.005) or within an allowed limit(0.01-2.0)- set forth in standard, As (arsenic) is low (6) or within an allowed limit (0.1-40) set forth in standard, content of Hg (mercury) is low (0.05) or within an allowed standard (0.01-0.85) for soil, Pb (lead) is low (25) or within an allowed standard (2-300) set forth in standard.

Mixed soil sample-5.

Sampling was taken next to Dundgol River Railroad Bridge in area with wastes in western side of bridge past the old bridge at Dund River. 10 samples were taken from 7 cm of depth of 10 different areas within 250 square meter area and samples were mixed into one sample X-5.

Figure 76. 10 samples were taken from 7 cm depth of 10 different points of this area

According to laboratory analysis of heavy metal content of nearby area of Dundgol River Railroad Bridge, content of Chrome is low (51) or within an allowed limit (5-1500) set forth in standard, Cadmium is very low (<0.005) or within an allowed limit (0.01-2.0) of standard, Arsenic is low (9) or within an allowed limit (0.1-40) of standard, Mercury is low (0.19) or within an allowed limit of soil (0.01-0.85) set forth in standard, Lead is low (97) or within an allowed standard (2-300) set forth for soil.

Compiled results of heavy metal content of sampled soils are shown in Table 29.

Table 29. Heavy metal content of the soil (mg/kg)

No of Samplings	Hg	Cd %	As	Pb	Cr
X-1	0.15	<0.005	18	45	49
X-2	0.19	<0.005	11	27	68
X-3	0.13	<0.005	7	62	40
X-4	0.05	<0.005	6	25	44
X-5	0.19	<0.005	9	97	51
MNS 5850:2008	2	3	50	100	150

3.3.6 Quality Of River Sediment

Two samples were taken to determine sediment quality of Dundgol River (for location of samplings please see Figure 77). One sampling was taken upstream of Dundgol River away

from Project area and second was taken in downstream Dundgol River within project area to identify baseline status of sediments beneath water flow.

Sediment sample -1. (Sed-1) Sediment sample was taken from downstream of Dundgol River about 400 meter from Dund River Railroad Bridge.

Figure 77. Sediment sampling location

According to the results of analysis of heavy metal content of sediment sample taken from the bottom of nearby water, content of Cr (chrome) is low (23) or within an allowed limit (5-1500) set forth in Mongolian standard MNS 5850:2008, Cd(cadmium) is very low (<0.005) or within an allowed limit (0.01-2.0) set forth in Mongolian standard MNS 5850:2008, As(arsenic) is low (11) or within an allowed limit (0.1-40) of standard, Hg(mercury) is low (0.05) or within an allowed limit (0.01-0.85) of standard, Pb (lead) is (481) or much more than an allowed limit (2-300) for soil and all data are put in table 30.

Table 30. Heavy metal content within the sediment (mg/kg)

Element	Hg	Cd	As	Pb	Cr
Sed-1	0.05	<0.005	11	**481**	23
MNS 5850:2008	0.01-0.85	0.01-2.0	0.1-40	2-300	5-1500

Sediment sample-2.

Second sediment sample (Sed-2) was taken upstream of Dundgol River 400 meters away from Dundgol River Railroad Bridge.

Figure 78. Sediment sampling location

According to the results of an analysis, content of Chrome is low (91) or within a (5-1500) allowed limit set forth in Mongolian standard MNS 5850:2008, Cadmium is very low (<0.005) or within an allowed limit (0.01-2.0) allowed limit set forth in MNS 5850:2008, Arsenic is low (13) or within an allowed limit (0.1-40) set forth by the standard, Hg is low (0.11) or within an allowed limit (0.01-0.85) for soil set forth by standard, Lead is low (57) or within an allowed limit (2-300) set forth in standard. Lab results are in table 31.

Table 31. Heavy metal content of the soil (mg/kg)

Elements	Hg	Cd	As	Pb	Cr
Sed-2	0.11	<0.005	13	57	91
MNS 5850:2008	0.01-0.85	0.01-2.0	0.1-40	2-300	5-1500

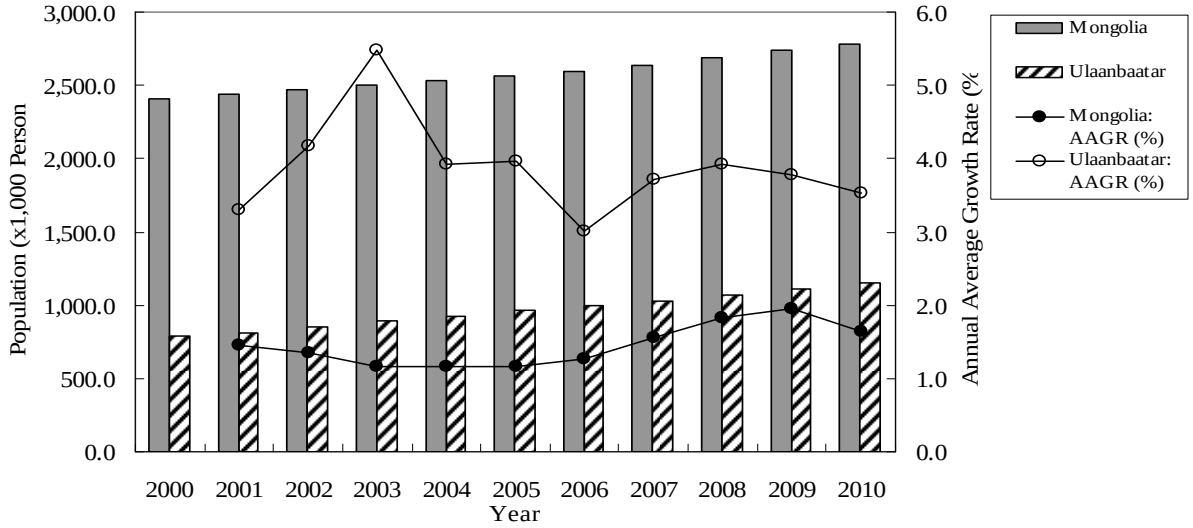
If take the lab results of sediment samplings, River pollution by heavy metals is a quite low or within allowable level set in the National standard, except lead content in the second sampling taken in the project area, which is 1.6 times higher than the upper limit of allowable Lead level (2-300). This indicates that Dundgol River is partly polluted by a heavy metal Lead and further study need to be done to identify a cause of pollution and extend of damage in the sediment of Dundgol River and to neutralize and clean the river from heavy metal pollution.

3.4 Social and Cultural Profile

3.4.1 Population and community characteristics

Population of Mongolia was increased from 2,44 mln to 2,811 mln within last 10 years (2001-2011) and it was increased by 1,1 times and population in Ulaanbaatar city is being rapidly increased 1.4 times from 810 thousands to 1,15 mln. Within last 10 years, average population growth of Mongolia is 1,6% (approximately 1,2-1,9%) which has normal growth level but percentage of population growth in Ulaanbaatar city is 3,5 % (3,0-5,5% a year) which is higher percent due to influences of citizens who are moved from countryside. As of 2011, number of population per 1 km area was 274 in Ulaanbaatar city and it was increased by 30 people compared to 2008, 19 people compared to 2009 and 9 people compared to 2010.

Displacement and movement was regulated under the plan until the first half of 1990 but in 1997 displacement and movement got free and population of Ulaanbaatar city was rapidly increased population of Ulaanbaatar city was increased by 5,5% a year and it is the high index. Since that time, growth percent was reduced a little but it was being increased by 3, 5% a year. Due to population of the city and economic growth number of automobiles is being increased and traffic movement will be difficult.



Source: Collection of Mongolian statistics, 2002-2010
Remark: AAGR, Annual average growth

Figure 79. Changes to population growth in Mongolia and Ulaanbaatar city.

Ulaanbaatar city consists of 6 districts and 3 satellite towns (figure 80), Songinokhairkhan district (24,8%) and Bayanzurkh district (26,2%) where approximately half of population lives here, lead others through growth of population and each of them was increased by 5% and 6,3% within last 10 years (2001-2010). (Figure 79) Furthermore traffic movement from the east and right sides being increased to the city center.

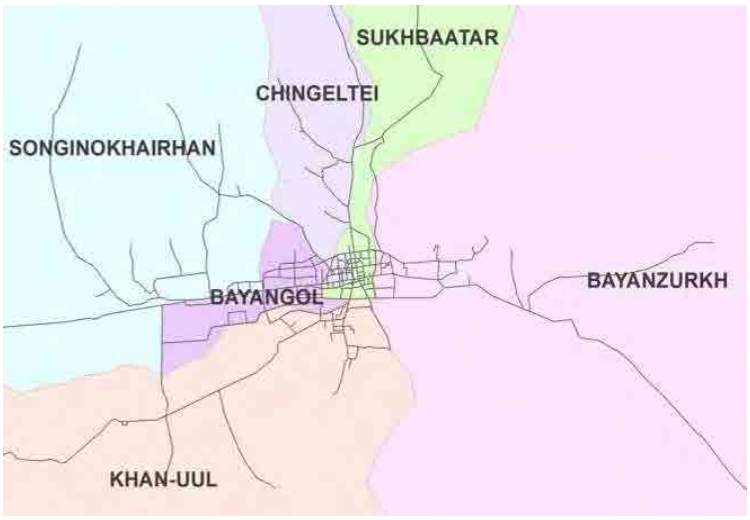
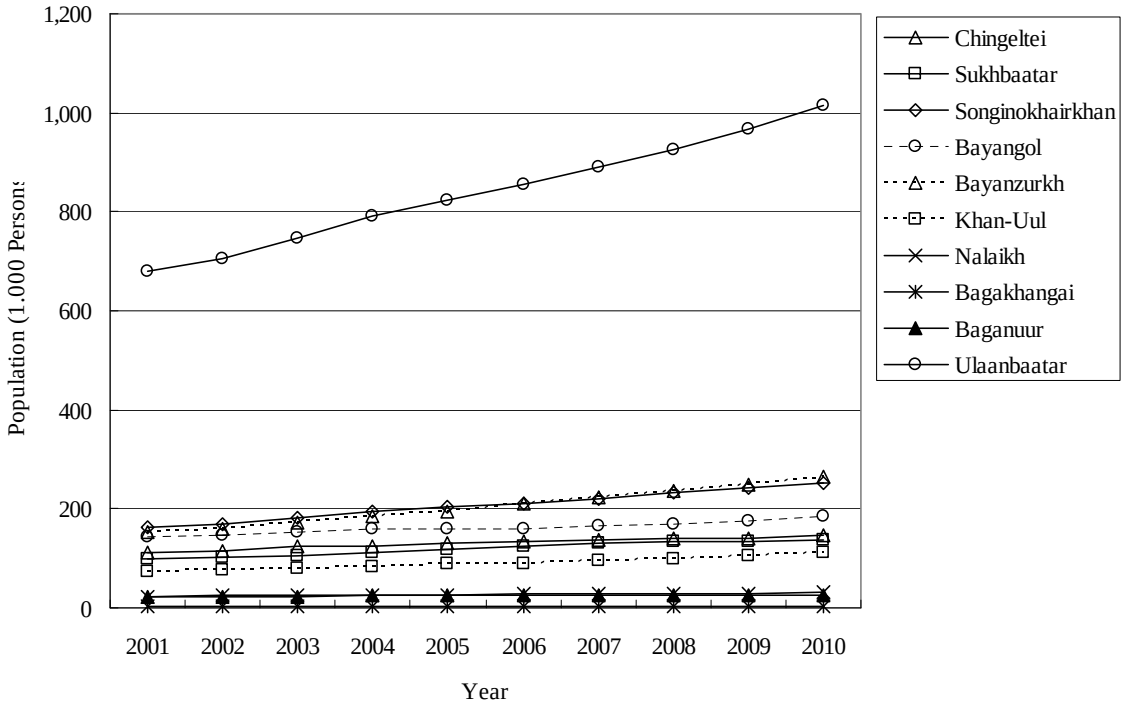


Figure 80. Boundaries of Districts of Ulaanbaatar city



Source: Road Authority, Ulaanbaatar city, 2011

Figure 81. Population displacement and movement in each district of Ulaanbaatar city (2001-2010)

Mongolia is developed by socialist socio-economic development for 70 years and number of population is relatively small compared to total territory and it can be a feature of historical development that differs from other Asian countries.

In 2009, economic growth of Mongolia was 0 percent due to work economic decline but in 2010 it was rapidly developed and GDP reached to 6%. Driving force of such intensive growth was that industrial growth reached to 10.0% and it reached to two-place numbers from minus growth. Growth in the mining sector reached to 10.1% and industrial growth reached to 11.4%.

caused over centralization of the city planning which is the main social issue of Ulaanbaatar city.

We can see population's literate level and educational level which was the main socio-economic index from the table of educational backgrounds with positive indexes. In addition, recent economic growth declined poverty rate too.

Table 32. Population and Economic growth

	2000	2008	2009	2010	2011
Population (1,000 people)	2373.5	2,666.0	2,716.3	2,761.0	2,811.6
Population in Ulaanbaatar city (1,000 people)	760.1	1147.4	1,196.8	1,244.4	1,287.1
Population in Ulaanbaatar city (%)	32.0%	43.0%	44.1%	45.1%	45.8%
Growth in GDP	1.1	8.9	-1.3	6.4	17.3

1. Land acquisition

Issues in relation to land acquisition are regulated by several articles of Mongolian laws.

Legal environment in relation to land relations:

In 2000, Mongolia has provided revised legal environment that regulates land relations (land exempt and resettlement (LER)). legal environment on land are as follow:

Constitution of Mongolia. Constitution of Mongolia confirmed that citizen of Mongolia must have personal property and rights to live in the healthy and safe environment and to get material financial assistances.

Article 6.4 of the Constitution reflected that if citizens use land for public demands, the state collect back the privatized or possessed land. Article 16.3 of the Constitution reflected the issue that issues compensation to land owner if the state collects back possessed land for public needs. There is an article reflected that if land owner uses the land as harmful or toxic for safety, environment and population's health of the country, the state directly collect back the land.

Land law. The land law was reflected to use the land by 3 types: first, ownership and full utilization rights. It is only related to citizen of Mongolia; second, It was reflected to possess, to be possessed a land by citizens, enterprises and organizations of Mongolia based on the agreement, also reflected that ownership right period is 15-60 years which can be extended by 40 years; third, use. It means that owner of the land can define or use any useful properties of land according to the agreement which was made to land owner and holder at the accepted scope under the law and it is issued to citizen of Mongolia and foreign legal body for period of 5 years which is entitled to be extended for 5 years.

At the article 5 of the Law reflected that issues compensation for changing or repossessing other's ownership land prior to expiry date of agreement valid. At the decision about changing or repossessing other's ownership land with compensation must be included market price of construction buildings and other properties which are not separated from the land and land exemption costs.

Detailed agreement will be made to Governor of the administrative unit, enterprises and organizations and will change or repossess the land with the compensation. Governor of the administrative unit will issue compensation to the citizen, enterprise and organization that used to possess the land within 60 days since agreement was made. Land owner must exempt the land within 30 days since he/she was fully paid compensation.

Civil code: Civil Code included several articles about land exemption. Article 1 of the law, citizen and the government must be the subject who has same legal rights for civil relations. Articles 6, 7, 8 of the law, reflected that citizens, enterprises, provinces, soums and districts are entitled to possess material or non material items or to participate to legal relation in connection to displacement. Article 10 of the law, reflected land and other real estates and article 11 reflected about land ownership rights.

Land possession right to citizen of Mongolia. This law stated exemption of owned land. Article 32.1 of the law reflected to repossess owned land for state special needs based on below special demands. Here includes:

- to provide state defense and safety;
- to create permanent observation field for scientific & technological tests, experiments and environmental and climate characters;
- To build state road, lines, networks and construction buildings

At least one year ago to make decision about changing or repossessing citizen's land based on the state special demands with compensation, governmental and administration organization in charge of land issues must agree about it to land owner in advance.

Here includes: a) land and real estate prices on it, b) displacement cost, c) investment amount made by land owner to the land, d) location, size, character and quality of land which is replaced by purchased land for state special demand, e) land exemption condition and period, f) compensation size, terms of payment and duration.

If they could agree, land owner will exempt the land within 1 year. If they couldn't agree, dispute will be solved by court.

Article 33 of the law: In case that governor of the soum and district is necessary to provide public interests of population in the country or territory, may define following servitude for possessed land by citizen. Here includes:

33.1.1. to transit through the land;

33.1.2. to place land border and permanent geodesic point in this area;

33.1.3. to execute works for reducing marsh;

33.1.4. To implement other land organization activities

Compensation will not be issued for taking such measures. In case that citizen who possesses the land, is not available to use or difficult to use due to public servitude in the ownership land owner citizen is entitled to claim authorized body who defined public servitude to purchase the land and also to pay caused losses or to pay costs equal to such difficulties or troubles.

37.1. Changing or repossessing process of citizen's ownership land based on state special needs under the compensation, will be done after following measures are implemented.

37.1.1. in case that replaces ownership land must be possessed good quality land which will not be disapproved from possessed land for its character and quality based on citizen's request.

37.1.2. in case that repossesses a land, must pay land price;

37.1.3. must pay price of real estate, placed in the citizen's ownership land;

37.1.4. must reimburse properties which were spent to land by owner;

37.1.5. Must fully reimburse any losses caused to owner due to that land was replaced or repossessed based on state special needs under the civil law and regulations.

Moreover, land law and law about land possession to citizen stated that must exemption of the owned land must be compensated by market price.

3.4.2 Historical and Cultural Resources

There is no any historical & cultural places and monuments recorded and registered in the territory where the "Ajilchin" flyover project will be implemented.

3.5 Socio-Economic features

3.5.1 Productions and services

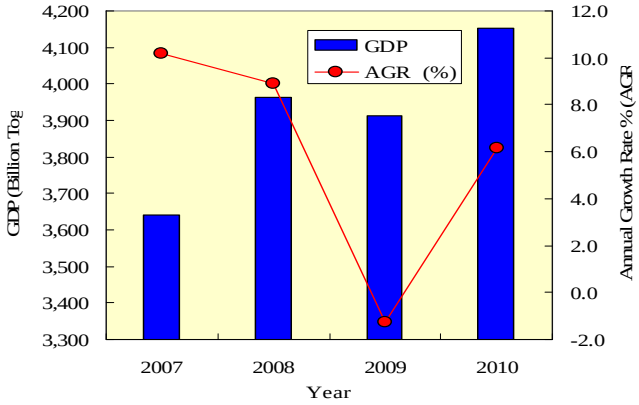
We have shown current situation and approaches of productions and services in Ulaanbaatar city by percent in Gross Domestic Products (GDP) at the table.

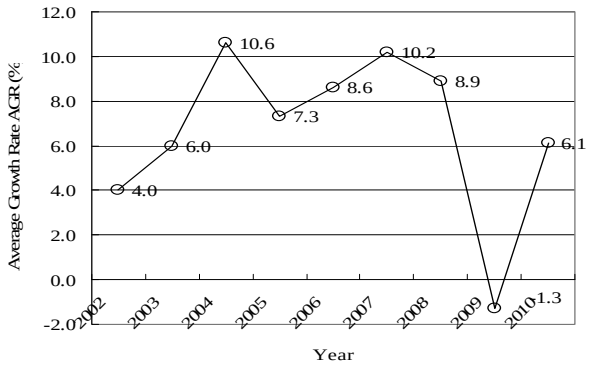
Table 33. Percent of productions and services of Ulaanbaatar city to GDP

2010				2011			
GDP, mln.tug	Percent to GDP			GDP, mln.tug	Percent to GDP		
	Agriculture	Industries & construction	Services		Agriculture	Industries & construction	Services
5 225 921.7	0.5	32.1	67.4	6 991 314.8	0.4	30.7	68.8

As a result of table data, production percent of the city to GDP was 30.7 percent in 2011 and it was declined by 1.4 percent from 2010 but service index was increased by 1.4 percent. It shows that influences of service sector are increased to the growth of GDP in Ulaanbaatar city.

Retails and wholesale, automobile and motorcycle repairing services played main role to increase additional costs at the service sector.





Source: Book about Mongolian statistics, 2002-2010

Figure 82. GDP and annual average growth

Figure 83. GDP annual average growth

We have shown total manufacturing capacity, annual average growth and growth changes of Ulaanbaatar city at the table 34 and figures 82 and 83 by the index 2007-2010.

Table 34. Total production sizes in the territory of Ulaanbaatar city (2007-2010)

Year	Production size GRDP(Unit：10billion.tug)	Average
2007	1,862.2	-
2008	2,173.7	16.7
2009	2,324.2	6.9
**2010	2,603.6	12.0
2007-2010	-	11.8

Source: Book about Mongolian statistics, 2002-2010

*Remark: **Preliminary estimation, AGR: Average growth (%)*

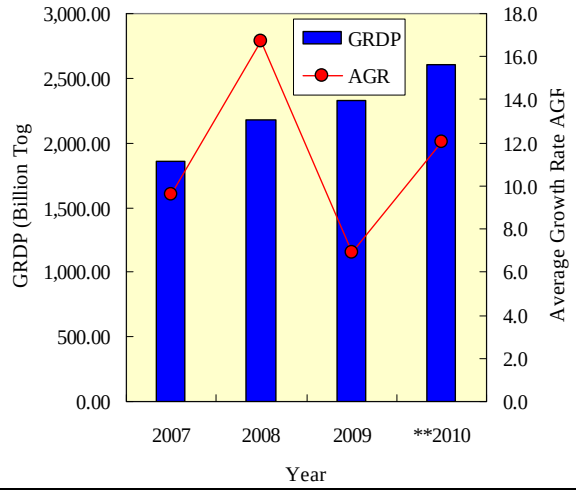


Figure 84. Production size of Ulaanbaatar city（GRDP）and annual average growth

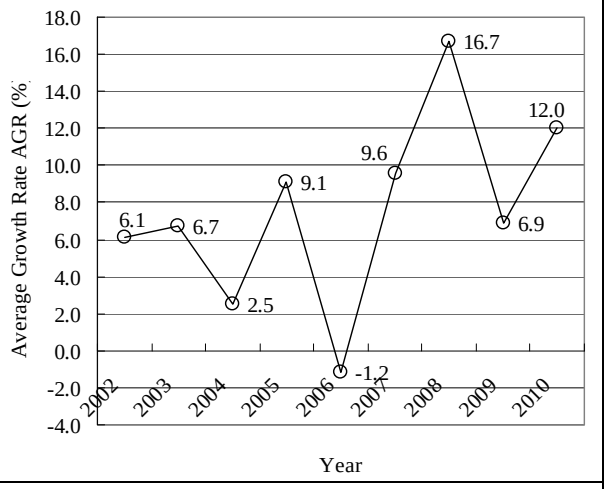


Figure 85. GRDP change to annual average growth

3.5.2 Infrastructure

For infrastructure, project location is in the city center and different kinds of engineering lines and networks are located above or underground in around the central part of city.

During the project preliminary surveys, JICA Study Team collected data about these lines and networks from Construction & Urban planning authority of Ulaanbaatar city, also they considered that information is not enough or complete, may have secret lines and networks which were not registered to the consolidated networks and they met each organization in charge of lines and networks and revised information.

Table 35 shows networks that can impact project works among the engineering & technical lines and networks included to the surveys.

JICA Study Team selected 10 points (D-1 ~ D-10) from engineering & technical lines and networks at the research scope, defined general location of the secret lines and networks by using ultrasounds device on each point, then defined location of drilling point based on the result of defined locations, drilled at 19 points and confirmed information.

Also they got information about proposed high voltage lines and its columns and new sewerage lines and also revised plans of railway authority.

Information is shown in table 35.

Table 35. Plan for future engineering and technical lines and networks

Type	Lines and networks	Work process	Remark
Energy	High voltage lines and its columns	Civil engineering work is being executed by now	Civil engineering works for new sub-station and (35kV) high voltage lines and its columns (H-26m) with financing of World Bank
		Planned to start civil engineering works in the middle of 2012	To draw and connect lines from above mentioned high voltage lines to the newly built apartment for railway employees (Golden park) (underground cable; GL-0.7-1.0 m) It is being implemented by funding of Ulaanbaatar city in the mid of 2012
Drainage	Sewer pipes	Civil engineering works are being executed	Large diameter sewerage lines (1 m size) will be installed in the east and west sides of cross section of Narnii zam near to ending point of the project
Railway	Railroad	At the proposal stage; Implementation period and detailed plan are not clear	New railway plan: Now offered to build one railway as 3 main railways but implementation period, actual extension limits of railway was not defined.

We planned to solve such infrastructure as follows in relation to civil engineering work of flyover.

Transfer plan for Engineering & technical lines and networks:

1. Baruun Teeverchid street

a/ Underground Engineering & technical lines and networks

In the Baruun Teeverchid Street, we are planning to build parking and road insulation lines with enough width between current roads and newly built roads. For that, we are planning to transfer and remove outside underground lines and networks below the routes of expected roads by providing enough fields for parking and road insulation lines.

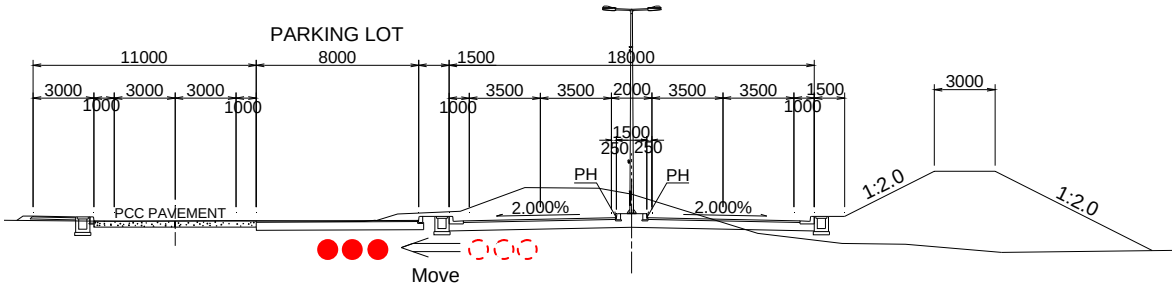


Figure 86. General settlement plan for Engineering & technical lines and networks in Baruun Teevershid street

b/ Heat Pipelines

Heat Pipelines are going across the expected roads of the project near STA. 0+440. In case that we repair road under the project, it is necessary to change it because current Heat Pipelines will pass through border of the road engineering works.

Moreover, for Heat Pipelines (φ300) which were connected to the railway ownership land from Narnii zam, we need to transfer it around south and north sides of STA1+500 without interrupting to foundation of the flyover. For other lines, settlement work volume becomes very high. Therefore, flyover is planned without removing lines. Locations are shown at the figures 87 and 88.

Figure 87. Heat pipeline near STA. 0+440

Figure 88. Heat pipeline near STA.1+500

1. Flyover section

There are many lines and networks which are hazardous to install close to lower structures-foundations of middle columns and flyover bridge. Also we expect that there are many engineering and technical lines and networks which are required to remove as we consider borders and limits of areas where install temporal protection equipment during the construction process even if it is not directly approached to design carcass. Moreover, these engineering & technical lines and networks must be removed far enough without interrupting flyover engineering works.

2. Narnii zam section

For underground lines and networks of Narnii zam, we considered future road repairing services, avoid changing routes and tried to remove it under the sidewalk. Moreover, cross breaks are planned to pave enough earth (above 0.8 m) and to make protection which are resistant in vehicle's loads.

3.5.3 Transportation

For all kinds of transportation, 44.1 mln/tons of freight and 296.2 mln people have been transported in 2011 and freight circulation reached to 4695.7 mln/per km. if detail transported passengers and goods: 25.6 mln/tons of freight, 291.8 mln people by auto road, 18.4 mln/tons of freight and 3.8 mln people by railway and 2.9 thous/tons of freight and 0.6 mln people by airlines.

Table 36 shows transportation indexes compared to previous year.

Table 36. Basic indexes of all kinds of transportation compared to previous years

Means of transportation	2008	2009	2010	2011
Freight circulation , mlnt/km				
Total	**9 051.4**	**9 016.4**	**12 127.8**	**16 336.7**
Railway	8 261.4	7 852.1	10 286.7	11 418.7
Auto	721.1	1 160.7	1 834.0	4 910.3
Airline	7.9	3.7	4.2	7.7
Transported freight thous.tons				
Total	**23 904.4**	**24 736.7**	**29 415.9**	**44 086.0**
Railway	14 646.9	14 171.5	16 804.0	18 447.7
Auto	9 255.7	10 563.8	12 610.2	25 635.3
Airline	1.8	1.4	1.6	2.9
Passenger circulation , mln per/km				
Total	**3 607.3**	**3 179.2**	**3 607.4**	**4 695.7**
Railway	1 400.4	1 008.5	1 220.0	1 399.7
Auto	1 215.0	1 535.9	1 480.2	2 321.8
Airline	991.9	634.9	907.2	974.1
Passengers , mln people				
Total	**231.6**	**232.5**	**250.7**	**296.2**
Railway	4.3	3.1	3.5	3.8
Auto	226.9	229.0	246.7	291.8
Airline	0.4	0.3	0.4	0.6

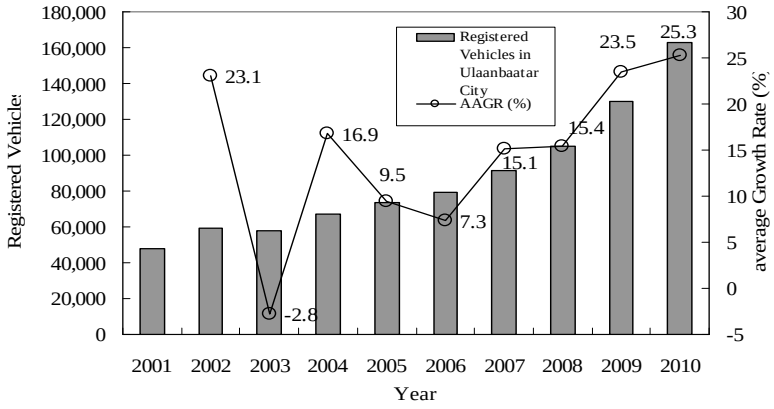
Freight circulation was increased by 14.7 mln/t or 49.9 percent and passenger circulation was increased by 45.5 mln passengers or 1.2 percent in 2011 compared to 2010. Freight on auto transportation was increased by 2.0 times compared to 2010 and according to technical control examination from 2011, number of all kinds of automobiles reached to 312.5 thousands, hence 208.5 thousands are cars, 75.1 thousands are trucks, 22.5 thousands are buses and 6.4 thousands are specially equipped vehicles. 67.1 percent of 209.8 thousands of total automobiles are in Ulaanbaatar city. Moreover, 18.2 percent of total automobiles was used for 9 years and 81.8 percent of them was used over 10 years.

Total length of improved auto transportation road in Mongolia reached 7633.4 km as of end of 2011 and hence paved road reached 4063.4 km. Total length of improved road was increased by 699.0 km in 2011 compared to 2010, hence paved road length was increased by 4063.4 km.

According to present transportation status, number of automobiles and quality issues are faced problems in Ulaanbaatar city. Thus, we consider growth in automobile quantities in relation to districts.

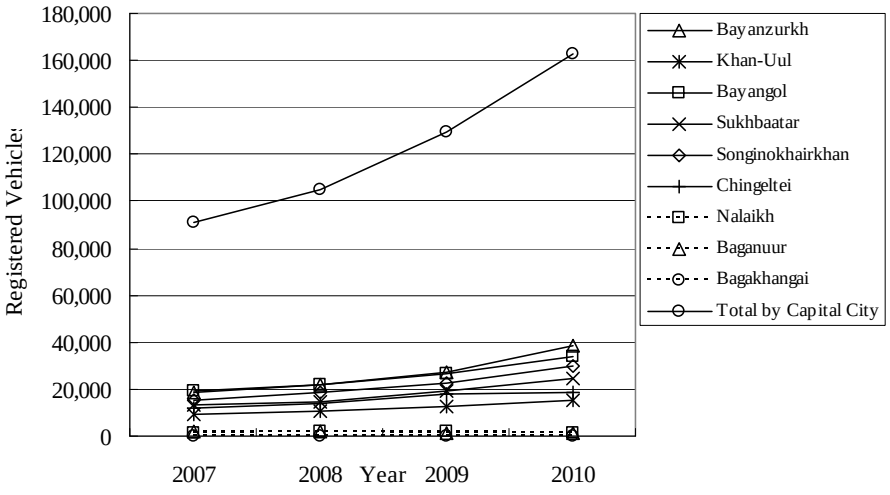
Quantity of automobiles of Ulaanbaatar city was increased by 14.5 percent a year within last 10 years (2001-2010). (Figure 82) This growth was declined for short period due to disaster in 2003 but it was intensively increased in 2007-2010 and as of 2010 reached to 162,000 and was higher index that was annually increased by 25.3 percent. Quantity of automobiles which was 48,000 in 2001 was increased by 3.4 times within 10 years. Due to influences of the rapid economic development in recent years quantity of automobiles may be rapidly increased.

Figure 89 shown quantity of automobiles which was reported by each district of Ulaanbaatar city (2007-2010). As of 2010, Bayanzurkh district had largest quantity of automobiles （23.6), Bayangol (20.7%), Songinokhairkhan （18.3%） and 63% of total automobiles is occupying in these 3 districts. Especially, in Songinokhairkhan district which has largest quantity of population quantity of automobiles was increased by 24, 8%, and 24, 6% in Bayanzurkh district.



Source: Book about Mongolian statistics, 2002- Road authority, Ulaanbaatar city 2011

Figure 89. Numerical changes to automobiles in Ulaanbaatar city (2001-2010)



Source: Book about Mongolian statistics, 2002- Road authority, Ulaanbaatar city 2011

Figure 90. Numerical changes to automobile holders of districts of Ulaanbaatar city （2001-2010）

Quantity of automobiles in right and east side districts of the city and also central district where the project is implemented is leading others and it confirms that “Ajilchin” Flyover will play important role to solve traffic jam.

3.5.4 Health And Labor Safety

Employees’ labor safety in Mongolia is regulated by the “Labor Law” and other applicable laws and regulations of Mongolia. The purpose of the Labor Law is to identify rights, obligations, mutual agreement, negotiations, sole or mutual labor dispute, labor conditions, administration, controls and liabilities for breaching laws and regulations of employee and employer who participate to labor relations based on the employment contract and to provide mutual equal rights and interests.

To make mutual agreement and negotiations parties will comply with following principles. 1. To become transparent

2. Must suit for laws and regulations
3. Number of parties’ representatives must be equal
4. Parties must have equal rights
5. To freely select and discuss issues which will be reflected to the mutual agreement and negotiations
6. To be obliged willingly
7. To clearly indicate liabilities

Following provisions must be appropriate to labor contract.

1. Work place or position name
2. Works and tasks
3. Basic pay or salary amount for the position
4. Labor condition

Work place conditions are divided as normal or abnormal labor conditions. Employer will be done evaluation to work places by professional authority. The law stated that an employee who works in the abnormal labor conditions will be issued pension under the flexible conditions.

Organization of work places must be suit for production technological requirements and provide safety and hygienic standards. Any chemical, physical and biological negative factors which can be caused at the work place during the production process must not be exceeded than hygienic norms and standards. Also must equip accommodation for employees at the work place according to hygienic standards. Employer must provide an employee through working uniforms and personal protective that meet safety and hygienic standards according to labor conditions, work and task features. Employer is obliged to clean, disinfect and repair working uniforms and personal protective.

Employer will confirm and be complied with internal rules for fire safety. Enterprises and organizations which were provided by fire alarm and fire extinguishing special equipment

must keep their permanent operations and train its employees to use them. Employer must implement all required measures against fire hazards.

Employer must provide, equip and furnish accommodation for temporary rest, warm and harboring purposes to the employee who is working at the open area in the inappropriate climatic conditions such as extremely hot, cold, windy and rainfalls or cool-work place according to labor standard.

Employer must provide an employee through work placed with convenient labor conditions and provide a condition that chemical, physical and biological factors which were caused during the production process don't make negative influences to labor hygiene and environment of work places. Employer will provide an employee who works in the abnormal labor condition through personal protective tools, special uniforms, toxic neutralization substance, foods and products.

Employer must be included employees to the necessary and preliminary or regular medical examinations in relation to productions, works and services according to regulations approved by the authorized organizations. Employer will be responsible for costs in relation to medical examinations.

3.5.5 Access to Health Services

Numbers of medical institutions which provide services to citizens and their growth and decrease dynamics are shown in table 37.

Table 37. Quantity of medical institutions

Index	2008	2009	2010	2011
State medical institution				
Clinical and specialized professional hospitals and centers	15	16	16	16
Clinical hospital of the district and province	36	35	35	35
Soum hospital	286	277	274	274
Inter-soum hospital	35	35	37	37
Private medical institutions				
Private hospital	1 063	1 082	1 113	1 184
Family hospital	228	226	218	219
Pharmacy	741*	636**	666**	703**

Remark. **Quantity of state and private pharmacies*
***Quantity of private pharmacies*

Total 41.1 thousands of employees worked for the medical sector in 2011 and it was increased by 3.8 percent compared to 2010. 7.9 thousands of total employees are physicians, 1.3 thousands are pharmacists and 16.5 thousands are medical assistant specialists; hence 9.4 thousands are nurses ad 15.4 thousands are other employees. According to the survey, number of family and soum physicians was declined compared to previous year.

It may have negative influences to access of medical services to urban and local citizens. But number of physicians was increased by 4.7 percent in 2011 compared to 2008, 11.2 percent compared to 2009 and 5.9 percent compared to 2010 and number of medical

assistant specialists was increased by 2.7 percent compared to 2008, 4.4 percent compared to 2009 and 4.2 percent compared to 2010.

We have shown accesses of medical services by regions or compared indexes at the table 38-40.

Table 38. Number of people who are available to one physician or nurse (state average index as of 2011)

Regions	Per physician	Per nurse
State average	337	284
West zone	517	301
Khangai's zone	531	321
Central zone	450	329
East zone	473	299
Ulaanbaatar city	240	253

Table 39. Number of people who were treated at the hospital, thous.per (compared to 2010, 2011)

Regions	2010	2011
State average	679.6	694.2
West zone	97.3	97.1
Khangai's zone	122.4	119.8
Central zone	100.8	98.6
East zone	45.5	46.4
Ulaanbaatar city	313.6	332.3

Table 40. Expenses at the medical sector (compared to 2010, 2011)

	2010	2011
Total expenses of total state budget, mln/tug	30 806 851.0	4 792 030.9
Total medical expense mln/tug	250 264.7	331 262.9
Percent of medical expense at the total state	8.1	6.9
Medical cost per person, thous.tug	91.4	123.6

3.5.6 Access to Education

Access to Education chapter includes number of educational training institutions, students, graduates, recruits and teachers at the all educational stages by its educational levels, zones and regions. Moreover, we considered training percent and student-teacher's relations and school omission percent at the general educational schools. Also we compared educational indexes of the countries which have different development levels.

As of today, there are total 752 general educational schools in Mongolia, hence 62 schools are elementary, 144 schools are basic schools, 545 schools are high schools and 74 schools are general educational schools with evening classes. There are total 172 universities, institutes, colleges and 49 vocational training and production centers, hence 5 institutes and colleges, 10 universities, nongovernmental: 22 vocational training and production centers, 77 institutes and colleges and 4 universities. There are 5 foreign universities which run their activities in Mongolia.

We have shown number of students at the all stages of educational institutions at table 41.

Table 41. Number of students in all types of educational institutions

/thous.tug/

Types of educational institutions	2010/2011	2011/2012
All students	732.0	729.6
Total of day class students at the general educational schools	512.2	505.4
Hence: Elementary	265.6	256.6
Secondary	172.9	169.2
High	73.7	79.6
Evening or home course students of the general educational schools	2.9	2.4
At the university, institute, college and vocational training & production center:	216.9	221.8
	139.1	141.3
where: 1.State owned:	34.7	37.2
where: Vocational training & production center	6.0	15.3
Institute and college	98.4	88.8
University	76.7	79.2
2. Nongovernmental:	11.4	10.9
where: Vocational training & production center	49.2	51.2
Institute and college	16.1	17.1
University		
Foreign schools which run their activities in Mongolia	0.4	0.4

In the session 2010-2011, total 133.7 thous. people graduated from the all stages of educational institutions, hence 86.7 thous. people completed general educational schools, 11.2 thousands graduated from vocational training and production center and 35.8 thousand people graduated from universities and colleges.

As we considered teacher's status, total 40.8 thousands teachers have been working for the all levels of educational institutions. Hence, there are 4.9 thousands kindergarten teachers, 26.5 thousands general educational schools, 2.1 thousands teachers of vocational training centers and 7.3 thousands teachers of the universities.

Figure 91 shows correlation between students and teachers.

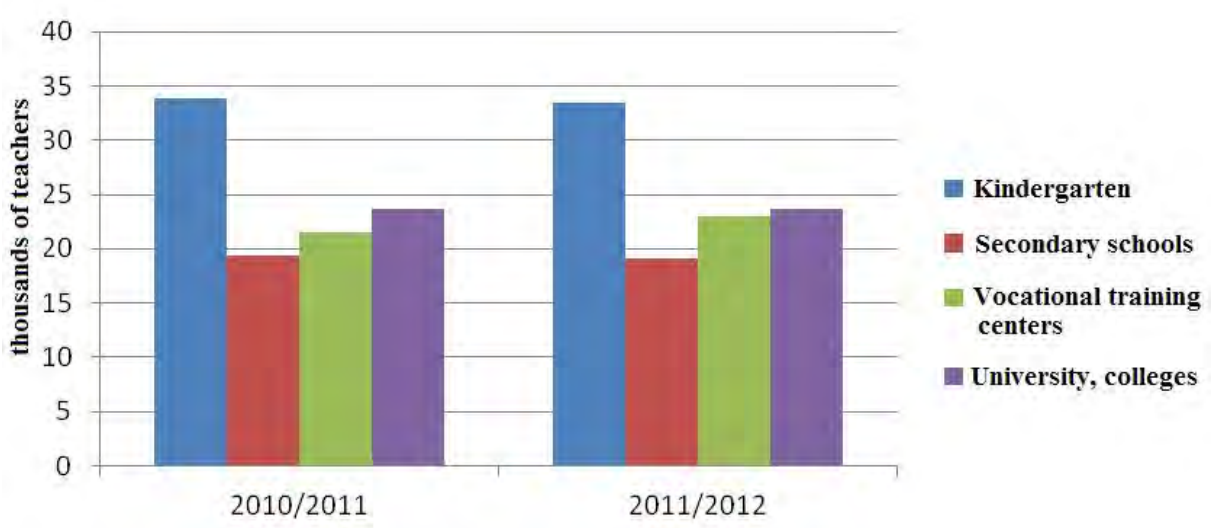


Figure 91. Student-teacher correlation at all levels of educational institutions

Table 42 shows compared indexes to countries which have different educational development levels

Table 42. Educational comparison, by percent

	Literacy	Elementary education	Secondary education	Complete secondary education
XXY higher countries	92.3	94.4	74.9	43.2
XXY average countries	80.7	88.5	57.0	17.6
XXY lower countries	61.2	73.4	30.9	6.0
Mongolia	97.3	88.7	82.0	49.8

3.5.7 Water supply and Sanitation

As research result shows, 62.1 percent of households in the city has improved water supplies, among which 40.8 percent uses water from centralized pipelines, 12.5 percent use from water distribution point which was connected to pipelines, 8.7 percent uses water from deep water wells and 0.1 percent used water from protected water well. For rural citizens, only 17.3 percent of total citizens use water from protected water sources and main source are deep water wells.

Table 43 shows result of the access of water supplies and sanitation buildings which was reported by households

Table 43. Access of water supplies and sanitation buildings, %

	From networks that were connected to centralized lines	From water distribution point, connected to lines	Depth hole water	Protected wells	Protected springs	Total
Urban households	40.8	12.5	8.7	_	0.1	62.1
Rural households	_	-	16.6	-	0.7	17.3
Total	25.0	7.5	11.7	-	0.3	44.6

Mongolia has been complying with following standards and norms for water supplies and sanitation.

- Regulation for saving water resources from pollution
- Pure classification of surface water
- Quality standard of drinking water UST 900-92
- Quality standards to Drinking-household and culture-household use water

It is still possible that some citizens, specially citizens migrated from rural areas and citizens in ger districts who are living in the suburb near the downstream in project implementation area may use water of Tuul river for their household consumption.

Thus, they must know pure classification and uses of surface water for sanitation.

1. Very pure water. This water is accepted to be used for all kinds of water consumption in case that implemented sanitation protection but we can directly use for household centralized or non centralized water uses at first or use after disinfection.

2. Pure water. This quality water is appropriate for using for all kinds of water uses in case that don't require high standards, also use it for the first type of water uses in the fish farm; only disinfect or filter it for drinking-household centralized or non centralized water supplies and food manufacturing use after disinfection.

3. Less contaminated water. This quality water is inappropriate for public drinking-household water supply and manufacturing uses in some cases but it is permitted to use it after purifying and disinfection process in case that strictly implemented sanitation protections; also it can be used for the 2nd type of water uses in fish farming and for cattle breeding water and recreation, physical educations sports of population.

4. Contaminated water. This quality water can be used for agricultural irrigation and also for water supplies of production technology by processing, filtering and softening it in advance.

5. Much contaminated water. Such water can be used for water supplies of production techniques which don't require direct human involvement by purifying, filtering and softening it in advance.

3.5.8 Roads and Communications

(1) Road

The railway that connects Ulaanbaatar city in the east-west routes is important transportation infrastructure of Mongolia, it simultaneously divides the city into south and north sides and it is the reason that causes obstacles to the traffic movement networks. Nowadays, there are Peace bridge and Gurvaljin bridge and 3 railway gates which intersect at the 5 railway points in the city center and it will be intersected at 6 points including "Narnii" flyover (Grant project from Japan) which will be commissioned in November of this year.

Peace Bridge was built by Chinese construction workers in 1960. Now, problem are faced regarding bridge loading and restricted movement of heavy-duty trucks. In contrast, magisterial road that connects Ulaanbaatar city in the east-west route, was restricted by Peace avenue and it increases movement intensity and is the reason for traffic jam.

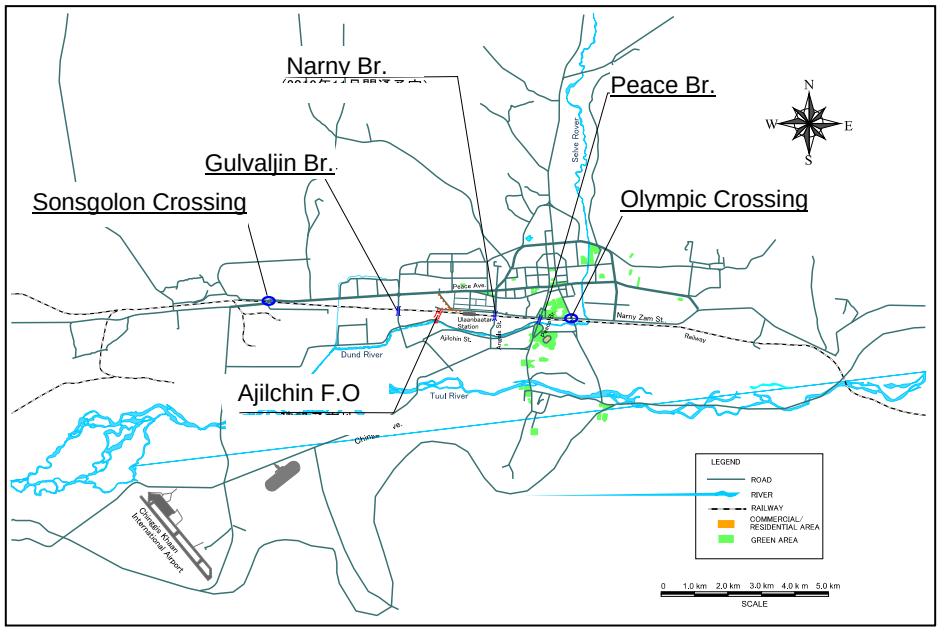
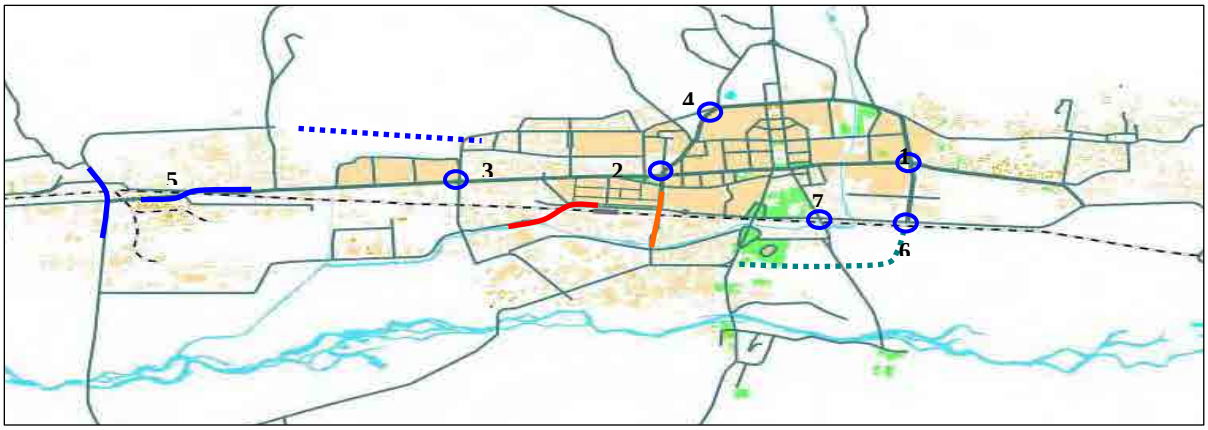


Figure 92. Points which are intersected by railway in Ulaanbaatar city

General development plan of Ulaanbaatar city till 2030, drafted proposal about auto road networks which improve east-west and south-north roads in order to solve these issues and also considered that “Ajilchin” flyover can be only bridge that is connected to the main magisterial in the east and west, which is connected through Peace avenue. Also it is impossible to freely convey the movement as a result of increased traffic intensities due to that crossing of the main roads of the city is intersected at the same level. Thus, we plan multilevel crossing at the 7 points besides “Ajilchin” flyover.

Figure 93 shows diagram for location planning of the multilevel crossing within the city according to research, executed by JICA Study Team.



Source: JICA Study Team. Plan for improving auto roads in Ulaanbaatar city

Figure 93. Planning to multilevel crossing locations in Ulaanbaatar city

(2) Communication

Base communication indicators have been shown by numbers of telephone and mobile phones, wireless telecommunication, in-line radio point, satellite telecommunication users, quantity of internet service (internet cafe), permanent internet users and computers.

Table 44 shows base communication indicators.

Table 44. Base indicators of communication sector

Base indicators	2010	2011
Number of communication sector	320	221
Number of postal branch	405	397
Telephone point, thous.	143.2	131.8
Number of television broadcast plants	378	378
In-line radios, thous.	56.2	50.5
Television, thous.	554.4	708.1
Number of cable television users	120 551	180 052
Number of mobile phone users (duplicated number) thous.	2 532.9	2 942.3
Wireless telecommunication users	45 461	44 999
Satellite communication users	773	986
Number of internet service organizations Internet café	77 200	85 180
Number of permanent internet users, thous.	199.8	457.6
Number of computers	373 075	421 901

According to indicators in table, quantity of mobile phone users was increased by 16.6 percent in 2011 compared to previous year, number of satellite communication users was 773 in 2010 but reached to 986 in 2011. According to it, quantity of landline telephone was reduced by 11.4 thous. In 2011 compared to 2010. Quantity of internet service organization was 77 in 2010 and it was increased as 86 in 2011.

Quantity of economic entities and organizations at the information and telecommunication sector reached to 1713 in 2011 and 35.8 percent of them are computer programming, consulting and related activities, 29.7 percent of them are layouts and publication services, and 17.3 percent is telecommunication and 8, 1 percent of them runs broadcasting and transmission activities.

3.5.9 Access to Energy

Table 45 shows access to Energy and its consumption.

Table 45. Access to Energy and its consumption, mln/kwt

Items	2010	2011
Resource-total	4 575.7	4 811.9
Produced	4 312.8	4 536.4
Import	262.9	275.5
Allocation – total	4 575.7	4 811.9
Used: where: Industries and construction Transportation and telecommunication Agriculture Families, apartments and public utilities Other	3 375.9 2 093.8 140.4 35.6 809.7 296.2	3 453.0 2 140.8 143.7 36.4 829.5 302.6
Distribution and line loss	505.4	644.3
Domestic uses of power plant	672.2	690.8
Export	22.2	23.8
Produced power per one person, kwt/hrs	1 574.8	1 628.1