Initial Environmental Examination and Environmental Management Plan

Project No.: 45007-009
March 2020

MON: Ulaanbaatar Urban Services and Ger Areas Development Investment Program (Tranche 3)

Prepared the Municipal Government of Ulaanbaatar for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 23 March 2020)

Currency unit	–	togrog (MNT)
MNT1.00	=	$0.00036
$1.00	=	MNT2,767.5

WEIGHTS AND MEASURES

^{o}C	–	degree Celsius
dB	–	decibel
km	–	kilometre
m	–	meter
m^2	–	square meter
Q	–	quarter

ABBREVIATIONS

ADB	–	Asian Development Bank
AP	–	Affected Person
DEIA	–	Domestic Detailed Environmental Impact Assessment
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
EMoP		Environmental Monitoring Plan
GADIP	–	Ulaanbaatar Urban Services and Ger Areas Development Investment Program
GEIA	–	General Environmental Impact Assessment
GHG	–	Greenhouse Gas
GRM	–	Grievance Redress Mechanism
H&S	–	Health and Safety
IEE	–	Initial Environmental Examination
MFF	–	Multi-tranche Financing Facility
MET	–	Ministry of Environment and Tourism
MUB	–	Municipal Authority of Ulaanbaatar city
NO^2	–	Nitrogen Dioxide
PIS	–	Project Implementation Support
PMO	–	Project Management Office
SO^2	–	Sulphur Dioxide
SPA	–	Special Protected Area
SPS	–	ADB Safeguard Policy Statement
TSP	–	total suspended particulate
UB	–	Ulaanbaatar
USUG	–	Ulaanbaatar Water and Sewerage Authority
WHO	–	World Health Organization

NOTES

In the report, “$” refers to US dollars; district – second level administration unit of Ulaanbaatar city; khoroo – sub-district division or third level (the smallest unit) administration unit under districts of Ulaanbaatar city.

CONTENTS

EXECUTIVE SUMMARY

1. Ulaanbaatar Urban Services and Ger Areas Development Investment Program was approved by ADB on 12 December 2013, using the multi-tranche financing facility (MFF) modality to initiate a redevelopment process in ger areas and develop urban subcenters as catalysts for growth. The program's framework financing agreement (FFA) was signed on 9 December 2013 and was ratified by the Mongolian Parliament on 23 May 2014. The implementation period is 10 years (December 2013–December 2023). It comprises three tranches of multi-sector interventions that support the Ulaanbaatar city master plan in upgrading priority infrastructure services and developing economic hubs (subcenters) in ger areas. While improved infrastructure will contribute to the city's inclusive development, better urban planning, combined with infrastructure along priority roads, will initiate the structural change of subcenters. Together, the investments will help transform the lives of the urban poor living in the ger areas by (i) enhancing access to improved basic urban services, public space, and socioeconomic facilities; (ii) providing better housing options; and (iii) supporting local economic development, allowing residents and businesses to take advantage of urban economies.
2. The previous two tranches (1 and 2) together have covered 1090 ha area, at four locations/subcenters. Three of the four subcenters (Selbe, Denjiin, and Dambadarjaa) were selected along the main trunk road to the north except Bayankhoshuu which is located in the northwest side of the city. All basic infrastructure investment for both stages of the project has been supported by social facilities investment like kindergarten, business incubator, urban park, sport complex, temporary apartments for affected people, and community development center.
3. The Tranche 3 aims (i) for the community to have a development vision;[1] (ii) to connect Sharkhad in the east and Tolgoit in the west to existing subcenters to create a network; (iii) to contribute the spatial restructuring and urban infrastructure provision in Tolgoit and Sharkhad, and remote ger areas to stimulate the community subcenters development as a residential hub of the west and east industrial area of the city; (iv) to improve community access to urban and economic services as well as improve surface water protection and ensure the safety of the area; (v) to deliver socioeconomic facilities; (vi) to complete the targeted investments under the Tranches 1 and 2; and (vii) to support institutional strengthening and capacity building.
4. The project policy toward the ger area residents is to ensure participation in the design development by determining their basic needs and by disclosing sufficient project information to them. The project will continue to engage local communities during the detailed design, pre-construction, construction and operational phases through regular consultation and meetings to ensure project affected people are protected with sufficient management measures.

Components of the Tranche 3

5. Components of Tranche 3 are summarized in Table 1 below.

[1] The community development vision for the Investment Program is to establish a network of well-developed subcenters providing economic opportunities and urban services, having a low impact on the environment, and improving the living conditions of the residents. The human-centered development is an approach towards achieving the community's development plan by providing the basic urban infrastructures where community needs for infrastructure are identified through engaging the residents.

Table 1. Tranche 3 Components[2]

Facilities [3]		Sharkhad project area	Tolgoit project area
Project Area		ADB project area: 124 hectares The subcenter area: 507 hectares	ADB project area: 153.4 hectares The subcenter area: 737 hectares
Project Area Population		ADB project area: 8,939 The subcenter area: 32,395	ADB project area: 6,860 The subcenter area: 18,545
Quantities of the Proposed Infrastructure	**Road**	Main road: Length 2.92 km, width 24.7 m Local road: Length 5.96 km, width 14.7 Total length: 8.87 km	Main road: Length 1.53 km, width 24.7 m Local road: Length 6.16 km, width 14.7 m Total length: 7.69 km 5 small bridges with total length of 160 m
	Heating	✓ Heating Supply Pipelines L = 6.62 km, diameter (D2x150~350 mm) ✓ Heat distribution substation (Nos.) = 3 Nos.	✓ Heating Supply Pipelines L = 4.31 km, diameter (D2x150~700 mm) ✓ Heat distribution substation (Nos.) = 7 Nos.
	Water	Water supply pipelines: diameter D150~400 mm, L = 7.95 km New water reserve with capacity V=2x1,000 m^3 New pump station with capacity Q=6,000 m^3/day	Water supply pipelines: diameter D150~300 mm, L= 2.9 km Expansion of existing water supply pipelines: diameter D150~250 mm, L= 941 m New pump station with capacity Q= 4,600 m^3/day
	Sewage	Sewage pipeline: diameter D200~300 mm, L = 3.85 km	Sewage pipeline: diameter D200~300 mm, L = 6.56 km
	Flood protection		Flood control reinforced concrete channel: width 1–4 m, total length: 3.12 km Sediment retention pond: 2 Nos.
	Power supply	Electricity switch gears: capacity of 10 kV each - 2 Nos. Closed type substations with transformer of 2x630 kVA power – 10 sets Electricity transmission line with 10 kV capacity: L= 20 km	Electricity switch gears: capacity of 10 kV each - 1 Nos. Closed type substations with transformer of 2x630 kVA power – 8 sets Electricity transmission line with 10 kV capacity: L= 15 km
	Telecommunication	Telecommunication's service and data center/3-storied building with 1,008 m^2 size/ -1 pcs Fiber optic cable: L= 5.5 km Primary duct (4+0), L5T type manhole/medium/: L = 8.85 km Primary duct (9+0), M1 type manhole /large/: L = 1 km Tower: 1 Nos. with height 25–30 m	Telecommunication's service and data center /3 storied building with 1008m2 size/ -2 pcs Fiber optic cable: L = 4.1 km Primary duct (4+0), L5T type manhole /medium/: L= 8.7 km Primary duct (9+0), M1 type manhole /large/: L= 0.5 km Tower: 1 Nos. with height 25–30 m
	Social Facilities	✓ 1 Kindergarten (230 Children) - 12,190 ㎡ ✓ 1 Sport Complex, - 20,013.5 ㎡ or 15,430.6 ㎡ (2 options)	✓ 1 Kindergarten (240 Children)- 12,720 ㎡ ✓ 1 Community Development Center - 4,609 ㎡

[2] The proposed infrastructure for Tranche 3 follows the Ulaanbaatar City Master Plan 2030.
[3] Heating and water demand estimations are based on projected population densification and increase by 2030.

Facilities [3]		Sharkhad project area	Tolgoit project area
		✓ 1 Community Development Center - 10,203 ㎡ ✓ 1 Business Incubator - 7,542.8 ㎡ ✓ 1 Urban Park / Green Belt - 16,432.5 ㎡	✓ 1 Business Incubator - 4,695 ㎡ ✓ 1 Urban Park/ Green Belt - 9,324 ㎡ and 12,432 ㎡ ✓ 1 primary health center with 50 beds

Summary of Environmental Issues

6. The initial environmental examination (IEE) report comprises of baseline data on the existing condition of the physical and biological environment, the anticipated environmental impacts, proposed mitigation measures, monitoring frameworks, grievance procedures, and public consultations. The consultant team undertook field surveys at the subcenters to assess the physical and biological environment—factors such as site ecology, management of construction, sanitation, use of equipment and machineries, environmental health and safety, occupational hazard, etc.

7. Environmental classification for the project is "Category B" as per ADB Safeguard Policy Statement (SPS) 2009. Potential impacts are mostly temporary, predictable, and reversible, and can be mitigated through adherence to implementation of the environment management plan (EMP). There are no sanctuary/protected areas or any other environmentally sensitive areas. No endangered or protected species of flora or fauna are reported at any of the sub-project sites.

8. A general environmental impact assessment (GEIA) for Tranche 3 was issued by the Ministry of Environment and Tourism (MET) in October 2019. As specified in the GEIA, Tranche 3 is subject to the Domestic Detailed Environmental Impact Assessment (DEIA). A local professional firm was hired to conduct DEIA for Tranche 3 which is expected to be completed in Q1 2020.

9. Construction-related disturbances such as noise, dust, soil erosion, surface water sedimentation, solid and liquid waste pollution, worker camp disturbances, reduced local access, increased traffic, and risk of worker and public injury will vary amongst the subcomponents but can be managed with measures recommended in the EMP. As assessed, the project benefits outweigh the negative impacts.

10. Key project impacts on environmental parameters are briefly summarized in Table 2 below:

Table 2. Summary of Negative Impacts on Key Environmental and Social Aspects

#	Environmental and social aspects and impacts	Impact Degree	Reason	Proposed Mitigation Measures
Pre-construction design phase impacts				
1	Land acquisition	High	Resettlement will be required for the new roads, and some of the new buildings and the new social service facilities.	A detailed land acquisition and resettlement plan (LARP) was prepared for Tranche 3. Affected households were consulted, surveyed, negotiated and resettled in proper manned following to the ADB SPS Guidelines and relevant domestic regulations.

#	Environmental and social aspects and impacts	Impact Degree	Reason	Proposed Mitigation Measures
2	Temporary use of land	Medium	The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labor camps for human resource to avoid environmental impact and public inconvenience.	These locations must comply with the local laws and regulations and need approval from authorities to utilize these facilities (access roads, telecommunication, and pipe borne water supply). It is important that selection of temporary lands does not infringe upon adjoining residential areas, water bodies, natural flow paths, and access roads to garages, and other amenities in the area
2	Design of infrastructure	Low	Conformity of type and scale of insulation of pipelines and other infrastructure facilities to national standards.	The design must lead to introduction of energy efficiency elements and conforms to national standard requirements.
3	Flood risks	Medium	Integrated with the design of the flood control measures is consideration of climate change in the region. Specifically, changes to average seasonal rainfall, and more importantly, the change in the frequency and severity of rainfall events.	The project design must ensure the existing drainage network, to which the new tertiary network will connect, is not flooded with silt and sediment from the upstream excavation and earthworks activities.
4	Linked facilities	Medium	Reliable operation of project constructed infrastructure will be dependent on the existing associated facilities in and around the subcenters, such as existing power substations, telecommunication substations, water reservoirs and pump stations etc.	The program management office (PMO) must confirm from concerned authorities of various linked and facilities such as landfills to accept solid waste, underground utilities such as heating pipes, sewage drainage, water pipeline etc. The detailed design and supervision consultant under PMO shall do the due diligence from design stage to construction stage.
Construction impacts				
1	Air Quality	Medium	Dust emission from the construction activity and emission of air pollutants from vehicles transporting construction material at site	Regular sprinkling of water, proper handling of excavated soil, construction material, banned substances/ Volatile Organic Compounds (VOCs), etc.
2	Water Quality	Low	The project will require small quantity of water for construction. No hazardous effluent is envisaged to be discharged during construction	The required water will be sourced from tankers by the construction company or from nearby wells in the subcenters.
3	Soil quality	Low	Soil erosion due to movement of construction trucks and soil pollution due to oil spills	Construction company will implement Spill management plan and affected land sites will be restored at the end of construction period.
4	Noise level	Medium	The construction activity may lead to noise pollution during concreting–steel cutting, bending, casting using vibrators, operation of mechanized equipment and drills etc., that will affect the local community	Noise monitoring will be done at regular intervals. If any night construction activity that is noise intensive is undertaken, staff and neighborhood must be consulted to determine suitable timings.

#	Environmental and social aspects and impacts	Impact Degree	Reason	Proposed Mitigation Measures
5	Land acquisition	High	Land acquisition and resettlement is required to provide sufficient space for the project to construct new roads and social buildings and utility pipelines.	A detailed LARP was prepared for Tranche 3. Affected households will be consulted, surveyed, negotiated and resettled in proper manned following to the ADB SPS Guidelines and relevant domestic regulations.
6	Community health and safety	Medium	Construction activities might lead to community health and safety concerns	The construction company will mitigate community health and safety impacts and risks following to EMP measures. Safe access to households, safe pedestrian pathways will be provided around the construction sites. Suitable construction timing which aims to reduce disturbance on local communities. Construction activities will be stopped during night time between 8:00 PM–8:00 AM.
7	Transportation and traffic	Medium	Increased movement of construction vehicles transporting construction materials might cause traffic safety concerns and increased traffic congestions.	All construction workforce including drivers will be trained in prior to commencement of construction works. A Traffic Safety Plan will also be implemented by the construction company. Transportation of construction materials to the Sharkhad subcenters is recommended to be made on Mondays when the automobile market is closed.
8	Waste generation	Medium	Domestic and construction waste will be generated during the construction period. Domestic waste will be generated from the social buildings during the operation period. Medical waste will be generated from the primary health center during its operation.	The construction company will implement Waste Management Plan throughout construction period following to the EMP. Operational entities will sign waste removal agreement with relevant district urban service agencies. The primary health center will sign medical waste removal agreement with the licensed agency – Element LLC which operates medical waste handling facility nearby UB city.
Operation phase impacts				
1	Improved roads	Medium	Improved/expanded and new roads might lead to increased vehicle accidents, and increased GHG production	Traffic Department of MUB will ensure that traffic signs, speed bumps and pedestrian crossings are provided in the area.
2	Water supply and sewerage networks	Low	Connection to the centralized water supply and wastewater might lead to increased water consumption and wastewater generation in the project areas. Concern failure of the pipelines leading to leakage or mass spills.	USUG[4] will be responsible operational efficiency for water supply and wastewater infrastructure for the areas.
3	Heated water supply	Low	Concern failure and rupture of a pipeline at, or between the 20+ heating line substations in the subcenters.	Heat Distribution Network SOE will be responsible operational efficiency for heating supply infrastructure for the areas.
4	Waste generation	Medium	Medical waste will be generated from the primary health center during its operation.	Medical waste will be handled as per Medical waste management procedures specified in Order. 505 of Minister of Health.

[4] Ulaanbaatar Water and Sewerage Authority (USUG) of the Ulaanbaatar City Urban Water Affairs and Management Authority.

#	Environmental and social aspects and impacts	Impact Degree	Reason	Proposed Mitigation Measures
			Domestic waste will be generated from the social buildings constructed by the project.	Operational entities of the social buildings will have designated waste collection point and will have waste transportation agreement with urban service agencies in their respective district.

11. Table 3 below gives key features, including environmental issues (if any) for the Tranche 3 subcenters:

Table 3. Key Features and Environmental Issues for Each Subcenter

No	Components	Location	Key features of component	Key Environmental Issues
1	Sharkhad subcenter	Bayanzurkh District, Ulaanbaatar	Connection to centralized heating, water supply, sewage network. Land acquisition is required for construction of 14 km paved road, construction of new buildings for kindergarten, middle school, community development center, sports complex, and business incubator. A densely settled ger area with no sensitive ecological resources.	Emission of dust and noise, traffic safety precaution required, pedestrian access must be provided, manual transportation of drinking water from nearby kiosks shall not be disrupted. Waste generation during both construction and operation period. Flood control measures and drainage plan must be carefully prepared. Avoid pollution to a marshland and Uliastai river that are outside of the subcenter. Potential failure of network or pipelines might lead to leakage or mass spills during operation. LARP must be prepared.
2	Tolgoit subcenter	Songinokhair khan district, Ulaanbaatar	Connection to centralized heating, water supply, sewage network. Land acquisition is required for construction of 17.5 km paved road, construction of new buildings for kindergarten, middle school, community development center, sports complex and business incubator. A densely settled ger area with no sensitive ecological resources.	Emission of dust and noise, traffic safety precaution required, pedestrian access must be provided, manual transportation of drinking water from nearby kiosks shall not be disrupted. Waste generation during both construction and operation period. Flood control measures and drainage plan must be carefully prepared. Potential failure of network or pipelines might lead to leakage or mass spills during operation. LARP must be prepared.

12. A Climate Risk Assessment was conducted for Tranche 3 in November 2019. Climate risk for the Tranche 3 subcenters was classified as “moderate” in the assessment report. The climate risk assessment concludes that drainage infrastructure will be under risk from an increased number and severity of precipitation events and recommends that a more nature-based “sponge” infrastructure be utilized in place of traditional non-porous construction. This will slow down water speeds, increase the re-use of storm water to maintain green spaces with related cooling, dust control and erosion control. Maximizing use of rapidly diminishing water resources wherever possible is necessary.

Conclusions and Recommendations

13. The EMP developed for Tranche 3 provides impact mitigation plans, environmental monitoring plans, and specify the institutional responsibilities and capacity needs for the environmental management of Tranche 3. The EMP will be updated at the detailed design

phase to ensure that EMP fully addresses the potential impacts of the final Tranche 3 subcomponent designs.

14. Effective traffic management and accident management plan will be prepared by Construction Company under guidance of PMO. Construction activities may require a camp for construction staff and/or machinery parking area and additional space for heavy machinery movement. Most workers will be local residents at the project sites in Ulaanbaatar city. The construction company to develop occupation health and safety plan for those workers from other regions as per EMP.

15. Modern state of the art buildings with equipment and building infrastructure fitted with firefighting and alarm systems, electric shockproof designs, seismic resilience, storm and flooding resilient structures are being designed by architects. Buildings will be designed having provisions for energy efficiency and green design.

16. Spoil accumulation points and disposal to be identified—inert material to go to waste fill site, other clinical/ medical waste will go to medical waste site during operations. Mongolia's domestic regulations on hazardous waste and chemicals are sufficient and will be enforced on handling of any hazardous material. A list of domestic guidelines, regulations and orders related handling, transportation and storing of hazardous waste are provided in Table 7 and Table 8 in Section 2.

17. Before start of construction, the construction company shall prepare a construction site specific EMP and obtain all requisite regulatory approvals from all concerned authorities. Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts, along with their associated costs in the IEE. Adverse impacts if noticed during implementation will be mitigated using appropriate design and management measures as per the EMP by the construction company.

18. Land acquisition and resettlement is required in order to provide necessary space for construction of project facilities such as new roads, new buildings and utility pipelines. LARP was prepared for the project during the Feasibility Study stage. Resettlement of households will be organized by MUB which must comply to national and ADB's requirements on land acquisition and resettlement.

19. The project is subject to domestic GEIA and DEIA which shall be conducted by a professional firm at the end of detailed design stage.

20. Since the project does not involve activities that have significant adverse impacts and no banned substances are present, an IEE has been developed comprising development of an environmental management plan and monitoring plan as per ADB's Safeguard Policy Statement (SPS) 2009.

I. INTRODUCTION

A. Background

1. Ulaanbaatar Urban Services and Ger Areas Development Investment Program was approved by ADB on 12 December 2013, using the multi-Project financing facility (MFF) modality to initiate a redevelopment process in ger areas and develop urban subcenters as catalysts for growth. The program's framework financing agreement (FFA) was signed on 9 December 2013 and was ratified by the Mongolian Parliament on 23 May 2014. The implementation period is 9 years (December 2013–December 2022). It comprises three tranches of multi-sector interventions that support the Ulaanbaatar city master plan in upgrading priority infrastructure services and developing economic hubs (subcenters) in ger areas. While improved infrastructure will contribute to the city's inclusive development, better urban planning, combined with infrastructure along priority roads, will initiate the structural change of subcenters. Together, the investments will help transform the lives of the urban poor living in the ger areas by (i) enhancing access to improved basic urban services, public space, and socioeconomic facilities; (ii) providing better housing options; and (iii) supporting local economic development, allowing residents and businesses to take advantage of urban economies.

2. The previous two tranches (1 and 2) together have covered 1090 ha area at 4 locations/subcenters. 3 of them (Selbe, Denjiin, and Dambadarjaa) were selected along the main trunk road to the north except Bayankhoshuu which is located in the northwest side of the city. All basic infrastructure investment for both stages of the project has been supported by social facilities investment like kindergarten, business incubator, urban park, sport complex, temporary apartments for affected people, and community development center.

3. The PMO, in consultation with Ulaanbaatar City Master Plan Agency (MPA), the consultant and ADB project team, in February 2019, proposed to include Tolgoit located in the West part of Ulaanbaatar and Sharkhad located in the East part of Ulaanbaatar under Tranche 3. Both locations share characteristics that are in line with the selection criteria indicated in the Program FFA.

4. Environmental management for the previous tranches is being carried out properly. Tranche 1 is under construction phase where the civil works contractors are implementing the EMP properly under supervision by the PMO ESS and a local contracted environmental monitoring firm. All measures specified in Tranche 1 EMP have been implemented successfully. Environmental monitoring reports for Tranche 1 have been submitted to ADB since the start of construction in 2018. And EMP Implementation report which is prepared by the PMO ESS is submitted to the Ministry of Environment and Tourism at the end of every year.

5. The environmental impacts arise at the Tranche 1 construction sites are assessed and addressed in the Tranche 1 IEE and EMP. However, there were two issues that have not been anticipated and considered within the Tranche 1 IEE and EMP study. The first issue is that shallow ground water (or soil water) comes out at earthwork/digging sites, such as building foundation sites and utility pipelines trench digging sites in Selbe subcenter. The reason for such soil water coming out at earthwork sites is that the Selbe subcenter is located within the Selbe river valley where there are water bearing sediments in the top layers of soil. As required by the PMO, the civil works contractors have carried out drainage works. The drained soil water was used for water spraying to reduce dust emission. The second issue is that roads constructed by the project were planned without trenches/drainages to remove rainwater. The PMO engineers have revised the road designs to include trenches/drainages on both sides of

the project road. For more details on these issues and mitigation measures, please refer to the annual Tranche-1 Environmental Monitoring Reports submitted by the PMO to ADB. Both of these issues have been drawn as lessons for the subsequent tranches as well as reflected in the Tranche 3 EMP as additional mitigation measures for pre-construction and design phase.

6. Tranche 2 have scheduled commencement of construction in Q2 2020. The MUB has already selected an Engineering Supervision consultant for Tranche 2 which includes an environmental monitoring specialist whose job description was prepared in line with the requirements in Tranche 2 EMP.

B. Outcome and impact of Tranche 3

7. Tranche 3 will have three outputs:

(i) Roads and urban services are expanded within priority subcenters, and connectivity between them is improved;
(ii) Economic and public services in targeted areas are increased; and
(iii) Institution and capacity are strengthened.

8. Geographical scope of the IEE study on Tranche 3 covers Sharkhad subcenter in eastern area and Tolgoit subcenter in western area.

Figure 1. Location Map of Subcenters of Tranche 3

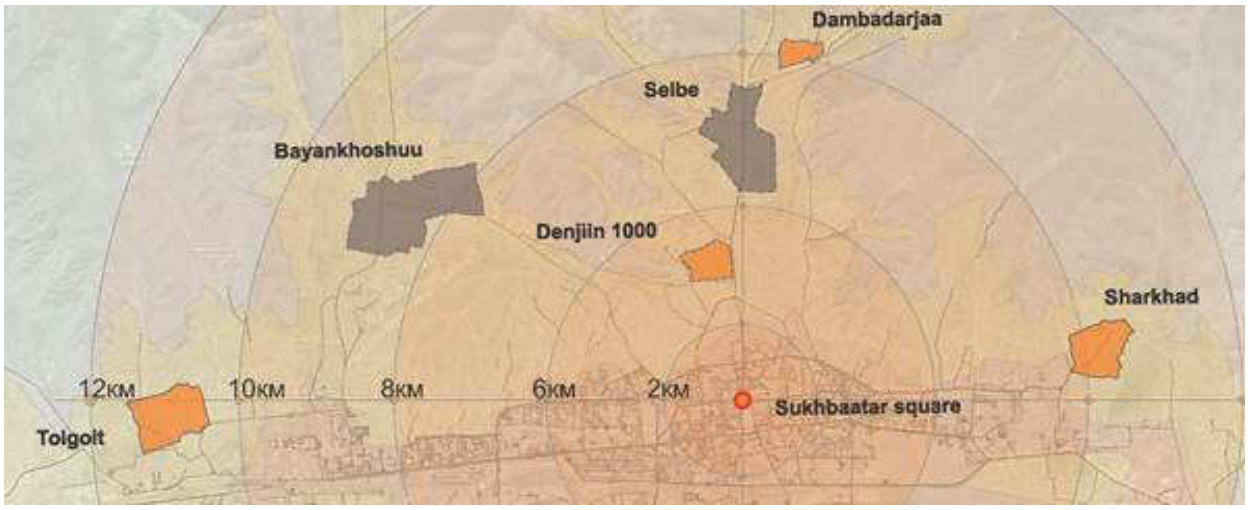

Figure 2. Sharkhad Subcenter

Figure 3. Tolgoit Subcenter

9. Tranche 3 subcomponents are summarized in Table 4.

Table 4. Summary of Tranche 3 Components

Facilities		Sharkhad project area	Tolgoit project area
Project Area		ADB project area: 124 hectares The subcenter area: 507 hectares	ADB project area: 153.4 hectares The subcenter area: 737 hectares
Project Area Population		ADB project area: 8939 The subcenter area: 32395	ADB project area: 6860 The subcenter area: 18545
Quantities of the Proposed Infrastructure	**Road**	Main road: Length 2.92 km, width 24.7 m Local road: Length 5.96 km, width 14.7 m Total length: 8.87 km	Main road: Length 1.53 km, width 24.7 m Local road: Length 6.16 km, width 14.7 m Total length: 7.69 km 5 small bridges with total length of 160 m
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Facilities		Sharkhad project area	Tolgoit project area
			Tower: 1 Nos. with height 25–30 m
	Social Facilities	✓ 1 Kindergarten (230 Children) - 12,190 ㎡ ✓ 1 Sport Complex, - 20,013.5 ㎡ or 15,430.6 ㎡ (2 options) ✓ 1 Community Development Center - 10,203 ㎡ ✓ 1 Business Incubator - 7,542.8 ㎡ ✓ 1 Urban Park / Green Belt - 16,432.5 ㎡	✓ 1 Kindergarten (240 Children)- 12,720 ㎡ ✓ 1 Community Development Center - 4,609 ㎡ ✓ 1 Business Incubator - 4,695 ㎡ ✓ 1 Urban Park/ Green Belt - 9,324 ㎡ and 12,432 ㎡ ✓ 1 primary health center with 50 beds

C. Assessment context

10. Similar to the previous tranches of GADIP, Tranche 3 is under category B for environment pursuant to ADB's 2009 Safeguard Policy Statement and recent good practice sourcebook. Category B project will have potential adverse impacts that are less adverse than those of a Category A project, are site-specific, largely reversible, and can be mitigated with an environmental management plan (EMP). The Tranche 3 is required to have a domestic DEIA to fulfill requirements of the MET and the Mongolian Law for EIA. The Ministry of Environment and Tourism has issued a General Environmental Impact Assessment (a general conclusion document which determines a detailed EIA is necessary for the project) on 15 October 2019. The GEIA concludes that a domestic DEIA necessary for the Tranche 3. Domestic DEIA is being prepared by a local professional firm will be approved by MET once the Tranche 3 Feasibility Study is approved by MUB. The expected date of DEIA approval is Q1 in 2020.

D. Structure of report

11. The structure of this IEE report follows closely the format of the ADB SPS (2009) as dictated by Project EARF prepared for the Multi-tranche Financing Facility. The IEE was conducted and results presented by individual subcenters. Environmental condition and impact assessment results are presented together in order to minimize redundancy. The report structure is consistent with and supports the single EMP that has been prepared for the component developments of the two sub-centres, and which is developed from the results of the IEE.

E. Scope of work and methodology adopted

12. The scope of the IEE study is:

(i) To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area;
(ii) To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
(iii) To prepare a mitigation plan outlining the measures for protecting the environment including institutional arrangement and environmental monitoring;
(iv) To identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed project;
(v) To carry out consultation with local people to identify the public perception of the project; and
(vi) To establish the Environment Monitoring Plan (EMoP) for the MUB to submit environmental monitoring reports to ADB at regular intervals.

13. Field surveys were undertaken to assess physical environment in May 2019. However, the exact physical location within the site for some subcomponents may vary after the exact demarcation of locations by the planners and engineers who are preparing Feasibility Study and design.

14. The IEE report comprises baseline data on existing condition of physical, ecological, economic, and social information, together with the anticipated environmental impacts and proposed mitigation measures.

15. Detailed assessment of secondary source baseline environmental data for Ulaanbaatar city was done to support the findings of the field survey by consultants. The field studies were supported by data collected from secondary sources such as internet, forest atlas, published data from Government of

Mongolia documents, population census statistics data, as well as documents from the PMO and documents from other government departments, etc.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. National environmental laws, regulations, and standards

1. Environmental policy framework

16. Mongolia has enacted a comprehensive policy and legal framework for environmental assessment and management. It has policies, legislation and strategies in place to manage the protected estate, to satisfy its international obligations, and to protect the quality of the environment for the health and well-being of its citizens. The hierarchy of policies and legislative provisions for environmental management in Mongolia comprises five layers ranging from the Constitution to international treaties, and to environment and resources protection laws. [5]

The main policy documents are the National Biodiversity Program 2015–2025 and a set of environmental laws that were amended in May 2012 including the Law on EIA. The Government of Mongolia has adopted Green Development Policy in 2014 which aims to advance Mongolia's national development in an environmentally sustainable manner, building the conditions for future generations to benefit and gain in the long term and to ensure environmental sustainability through creation of growth based on green development concepts and through citizen's participation and inclusiveness. It seeks to ensure green development for Mongolia through achieving six main objectives: (i). Promote resource efficient, low carbon production and consumption with emphasis on waste reduction. (ii). Maintain ecosystem balance and reduce environmental degradation while intensifying reclamation activities and environmental protection. (iii). Promote investment in environmental protection, human development and clean technology and leverage tax, credit and incentive mechanisms to finance green economy. (iv). Promote green jobs, reduce poverty and promote green lifestyle. (v). Make education, science and technology and innovation accelerators of green development by promoting environmentally adapted style and cultural values. (vi). Plan and implement human settlement adapted to climate change, and natural resources carrying capacity.

17. The key principles of the Green Development Policy are: (i). harmony between sectorial policies and planning are consistent with green development concepts, (ii). support for clean advanced technologies, (iii). citizens' participation and inclusiveness in green growth, (iv). environmentally friendly attitudes, habits and competencies, (v). transparency, accountability and liability and (vi). efficient, effective and rational use of resources.

2. Environmental laws and regulations

18. The Government of Mongolia undertook a major environmental law reform in 2012 including the law of land, protected areas, water, forest, wildlife, and native flora resources. The key environmental legislation is shown in Table below and their applicability to the project.

[5] UNDP. 2008. *Institutional Structures for Environmental Management in Mongolia*. Ulaanbaatar and Wellington.

Table 5. Summary of Applicable Laws to the Tranche 3

Law	Enacted and Amended	Brief Description	Relevance to the project
Law on Development Policy Planning	November 2015	Convene public consultation with the affected communities on the scope and impacts of policies, strategies and programs.	The Tranche 3 is subject to Chapter 19 of this law.
Law on Legal Status of the Capital City	Enacted in 1994 and amended in February 2013	Any entities and organizations in the capital city regardless of the type of ownership will be liable for: 1. Comply with administrative directives by the municipality and other legislations and keep informed their employees 2. Provide support to the implementation of the capital city specific programs by the municipality 3. Operation and maintenance of private properties (land, buildings, etc.) and surrounding public amenities will comply with requirements and standards	The Tranche 3 is subject to Chapter 12 of this law.
Law on Environmental Protection	Enacted in 1995 and amended in May 2017	To ensure safe environment, have ecologically balanced social and economic development, and for the protection of the environment for present and future generations, the proper use of natural resources and the restoration of available resources". Its Article 7 requires the conduct of natural resource assessment and environmental impact assessment to preserve the natural state of the environment, and Article 10, the conduct of environmental monitoring on the state and changes of the environment.	The project is subject to this law because impacts of construction works on air quality and soil will arise.
Law on Environmental Impact Assessment	Enacted in January 1998 and last amended in May 2012.	Regulates "relations concerning protection of the environment, prevention of ecological imbalance, the use of natural resources, assessment of the environmental impact and decision-making on the start of a project". It sets out the general requirements and procedures for project screening and conduct of environmental assessment and review.	The project is subject to this law because construction road, buildings and infrastructure facilities will need to have GEIA's.
Law on Land (revised)	Enacted in 2013 and amended in 2018	Regulates the possession and use of land by a citizen, entity and organization, and other related issues. Articles 42/43 provide guide on removing possessed land and granting of compensation relative to removing.	The project is subject to this law because there will be land acquisitions.
Law on Soil protection and prevention from desertification	Enacted in 2012 amended in 2015	Regulates matters related to protection of soil deterioration, exclamation, and prevention from desertification	The project is subject to this law because there will be earthworks during construction and soil resources will be used.
Law on Water (revised)	Enacted in 2012 and amended in 2017	Regulates relations pertaining to the effective use, protection and restoration of water resources. Specifies regular monitoring of the levels of water resources, quality and pollution. Provides safeguards against water pollution.	The project is subject to this law because of water consumption both during construction and operation.
Law on Fees for Water Pollution	Enacted in 2012 and amended in 2017	Regulates determination and registration of water polluters, subject for water pollution fees, operations of urban water supply and sewerage networks, protection of sewerage pipelines and technical requirements for locations of WWTP.	The project is subject to this law because wastewater facilities will be built.
Law on Air (revised)	Enacted in 2012 and amended in 2018	Regulates the protection of the atmosphere to provide environmental balance and for the sake of present and future generations. Allows government to set standard limits to emissions from all sources. Regulates regular monitoring of air pollution, hazardous impacts and changes in small air components such as ozone and hydrogen.	The project is subject to this law because there will be impacts on air quality during the construction.
Law on Fees for Air Pollution	Enacted in 2010 and amended in January 2018	Regulates registration of air polluters, physical factors to determine air pollution fees and exemptions.	The project is subject to this law because of emission of dust and pollutants during the construction period.

Law	Enacted and Amended	Brief Description	Relevance to the project
Law on Hygiene (revised)	Enacted in 2016 and amended in 2017	Governs relationships concerning maintenance of sanitary conditions, defining the general requirements for sanitation in order to ensure the right of an individual to healthy and safe working and living conditions, ensuring normal sanitary conditions, defining the rights and duties of individuals, and economic entities and organizations with this respect.	The project is subject to this law because because workplace hygiene requirements apply to construction sites.
Law on Waste	Enacted in 2017	Governs the collection, transportation, storage, and depositing in landfills of household and industrial waste, re-using waste as a source of raw materials to eliminate hazardous impacts of household and industrial waste on public health and the environment. Undertakings that generate significant amount of wastes must dispose of the wastes in designated landfills that meet prescribed standards.	The project is subject to this law because because waste will be generated both during construction and operation.
Law on Toxic and Hazardous Chemicals	Enacted in 2006 and amended in January 2018	Sets out basic requirements for handling of toxic and hazardous chemicals and risk assessment.	The project is subject to chapters 13 and 17 of this law.
Law on Disaster Protection	Enacted in 2003 and amended in 2012 and 2017	Regulates matters relating to the principles and full powers of disaster protection organizations and agencies, their organization and activities, as well as the rights and duties of the State, local authorities, enterprises, entities and individuals in relation to disaster protection.	The project is subject to this law because natural disasters such as flood and windstorm might happen at project sites.
Law on Re-development of Urban Settlements	Enacted in 2015	Sets out requirements and principles of Urban Planning. Emphasized that the top priority is to represent interest of residents.	The project is subject to this law because current ger areas will be re-developed.
Law on Land Privatization	Enacted in 2002 and amended in June 2018	Defines rights and obligations of the landowner, termination and re-possession of the ownership right and conditions for re-settlement.	The project is subject to this law because there will be land acquisition.
Law on Land Fees	Enacted in 1997 and amended in 2012	Regulates collection of land use fees by individuals and entities in Mongolia.	The Project is subject to chapters 3,4,8, and 12 of this law.
Law on Construction	Enacted in 2016 and amended in 2017	Sets out permits and technical requirements for design, construction materials, construction sites and civil works	The project is subject to this law because of construction of new buildings and infrastructure facilities
Law on Sanitation	Enacted in 2011 and amended in 2017	Sets out sanitary requirements to environment, urban planning and construction and workplace.	The project is subject to this law because of construction of sanitary pipelines and facilities.
Law on Labor	Enacted in 1999 and amended in 2017	This law aims to ensure equality in labor relations between employees and employers by defining roles, responsibilities and rights of them, work condition and terms of employment.	The project is subject to this law because labor force will be employed during the construction and operation.
Law on Labor Safety and Hygiene	Enacted in 2008 and amended in 2018.	This law defines state policy and control on work condition, requirements on occupational health and safety conditions and aims to ensure provision of safe labor condition for employees.	The project is subject to this law because labor safety requirements apply to all workplaces during construction and operation.
Law on Fire Safety	Enacted in 2015	This regulates affairs regarding fire safety and defines roles of organizations, entities and individuals to ensure fire safety at all places.	The project is subject to this law because fire safety requirements apply to all workplaces and buildings.

(a) Accession (e) Entry into force (r) Ratification
Source: Mongolia: Ulaanbaatar Urban Services and Ger Areas Development Investment Program (MFF), ADB, 2013, others.

19. Regulations and guidelines related to water and wastewater are listed in the Table 6. Tables 7 and 8 list key Mongolian orders for Hazardous waste and Hazardous chemicals respectively.

Table 6. Regulations and Guidelines Related to Water and Wastewater

Name of Guideline, Order, or Regulation	Year Adopted	Relevance to the project
Regulation of Fees on Water Pollution in 1992.	1992	If not managed well, there might be water pollution risks during construction.
Regulation on Water Resource Protection from Pollution in 1997.	1997	If not managed well, there might be water pollution risks during construction.

Table 7. Regulations and Guidelines Related to Hazardous Waste

Name of Guideline, Order, or Regulation	Year Adopted	Relevance to the project
Guideline on Reporting and Recording of Storage and Disposal of Hazardous Wastes By Order No: 127 of MNET in July 1, 2003.	2003	The project is subject to all these regulations because there might be hazardous waste during the construction such as used oil/fuel, paints and emulsion etc.
Classification and Specification and Hazardous Level of Wastes by Order No: 324/318/336 of Minister for Nature, Environment, and Tourism, Minster for Health, and Minister for Education, Culture and Science in 2006.	2006	
"Regulation on Types of Landfill and Disposal Facilities and Centralized Waste Disposal Sites, Relevant Requirements and Specifications, and Procedures to be Conducted By Economic Entities and Individuals to Bury and Destroy Hazardous Wastes" by Order No: 404 of Minister for Nature, Environment and Tourism in 2006.	2006	
Regulation on Issuing of Passport for Hazardous Wastes By Government Resolution No: 268 in 2006.	2006	
Payment Calculation Methodology for Hazardous Wastes by MNET in 2006.	2006	
Regulation of National Reporting and Inventory of Hazardous Wastes by MNET in 2009.	2009	

Table 8. Regulations and Guidelines Related to Hazardous and Toxic Chemicals

Name of Guideline, Order, or Regulation	Year Adopted	Relevance to the project
List of Products Containing Toxic and Hazardous Chemicals (Renewed In 2008) by Joint Order No: 126/171 by MNET and MOH on July 1, 2003.	2003	The project is subject to all these regulations because there might be hazardous and toxic chemicals be used for construction purposes and at workshops during the operation period.
Methodology of Calculating Waste Norms" by MNET, in 2006.	2006	
Regulation on Trans-Boundary Movement, Trade, Transportation, Export, and Import of Toxic and Hazardous Chemicals by Joint Order No; 92/90 of Minister for Nature, Environment, and Tourism and Minister for Foreign Affairs on December 29, 2008.	2008	
Guideline on Methodology and Technology to Dispose, Storage, Transportation, Collection of Chemical Wastes (2009)	2009	
Regulation on Use, Transportation, and Import of Toxic and Hazardous Chemicals (renewed in 2009)	2009	
Guideline on Transportation, Storage, Use, and Disposal of Toxic and Hazardous Chemicals and b) Guideline on Developing Risk Assessment of Toxic and Hazardous Chemicals" by Joint Order No: 28/40/29 of Minister for Health, Minister for Environment, Nature, and Tourism, and Chairman of National Emergency Management Agency on February 3, 2009.	2009	
Guideline on Classification of Hazardous and Toxic Chemicals was Approved in 2009.	2009	

20. The "Regulation on classifying, collecting, storing, transporting, recycling and disposing of hazardous medical waste" which was adopted with Order No. A/505 of Minister of Health, December 2017 will be the main guidelines for handling of medical waste for. This regulation provides guidelines for

management of hazardous medical waste through its eight appendixes each of which addresses different aspect as described below:

(i) Appendix 1 provides guidelines for classification and collection of medical waste;
(ii) Appendix 2 provides guidelines for storage of medical waste;
(iii) Appendix 3 provides guidelines for transportation of medical waste;
(iv) Appendix 4 provides guidelines for recycling and disposing of medical waste;
(v) Appendix 5 provides technical requirements on medical waste handling facilities;
(vi) Appendix 6 provides technical requirements on necessary equipments and devices for medical waste handling site;
(vii) Appendix 7 provides general requirements on medical waste management trainings; and
(viii) Appendix 8 provides registration template for medical waste.

3. Environmental assessment requirements of Mongolia

21. The EIA requirements of Mongolia are regulated by the Law on Environmental Impact Assessment (1998, amended in 2012). The terms of the law apply to all new projects, as well as rehabilitation and expansion of existing industrial, service or construction activities and projects that use natural resources. The purpose of this law is to protect the environment, prevent ecological imbalance, ensure minimal adverse impacts on the environment from the use of natural resources, and regulate relations that may arise in connection with the assessment of environmental impacts of and approval decisions on regional and sectorial policies, development programs and plans and projects. Table 9 lists all classes of projects that require GEIA according to the Mongolian law. The Tranche 3 falls in the category No.7 in the table below.

Table 9. Classification of Projects for which General Environmental Impact Assessment is Legally Mandatory

No	Project type	Executor	
		Central Government Authority for Nature and Environment	The Governors offices of Provinces and the Capital city
1.	Mining	Exploration of all kind of minerals	Exploration of common minerals to be used within local area
2.	Heavy industry	All types	-
3.	Light and Food industry	Big industries owned by Government	Local SMEs
4.	Agriculture	Water reservoir Irrigation system Plantation of fallow	Other industries and services
5.	Infrastructure	Energy production more than 1 MW capacity Electricity transmission line more than 35 kV voltage Heat distribution pipes Hydro station Railway Airport Road international and inter cities Communication international and inter cities	Energy production up to 1 MW capacity Electricity transmission line up to 35 KV voltage Heat distribution pipes local Road and communication local
6.	Service	Hotel, resort, sanatorium and other service organizations with capacity more than 50 bed day Tourism	Hotel, resort, sanatorium, and other service organizations with capacity up to 50 bed per day
7.	Other projects: Town planning Defensive and civil protection Water supply system	Water supply, water treatment and solid waste disposal in urban areas with more than 10,000 inhabitants State owned facilities for defense and civil protection	Water supply, water treatment solid waste disposal in urban areas with up to 10,000 inhabitants Local facilities for defense and civil protection

No	Project type	Executor	
		Central Government Authority for Nature and Environment	The Governors offices of Provinces and the Capital city
	Water treatment plant Solid waste disposal and others		
8.	Biodiversity	Fisheries (big size) Population, use and other activities relative to animal and plants,	Hunting and forestry, tribe Fishery for local market
9.	Chemicals, radioactive substances and hazardous wastes	Treatment, use, storage, transport and disposal of chemicals, radioactive substances and hazardous wastes	
10.	Activities to be conducted at special protected areas	Activities to be conducted in boundaries of special protected areas (SPA)	Activities to be conducted at locally protected areas.

22. The EIA requirements of Mongolia are regulated by the Law on EIA[6] (enacted 2012). The terms of the law apply to all new projects, as well as rehabilitation and expansion of existing industrial, service or construction activities and projects that use natural resources. law revised in 2012 and brought into force in 2013, implemented through a new Environmental Impact Assessment Regulation.[7] The 2012 revision introduces a requirement for Strategic Environmental Assessment for policy documents, and increases emphasis on public participation during a general EIA.

23. The purpose of the EIA law is environmental protection, the prevention of ecological imbalance, the regulation of natural resource use, the assessment of environmental impacts of projects and procedures for decision-making regarding the implementation of projects. The EIA process in Mongolia is summarized in Figure 4.

24. There are two types of EIA's defined under the Law on Environmental Impact Assessment (2012), as follows:

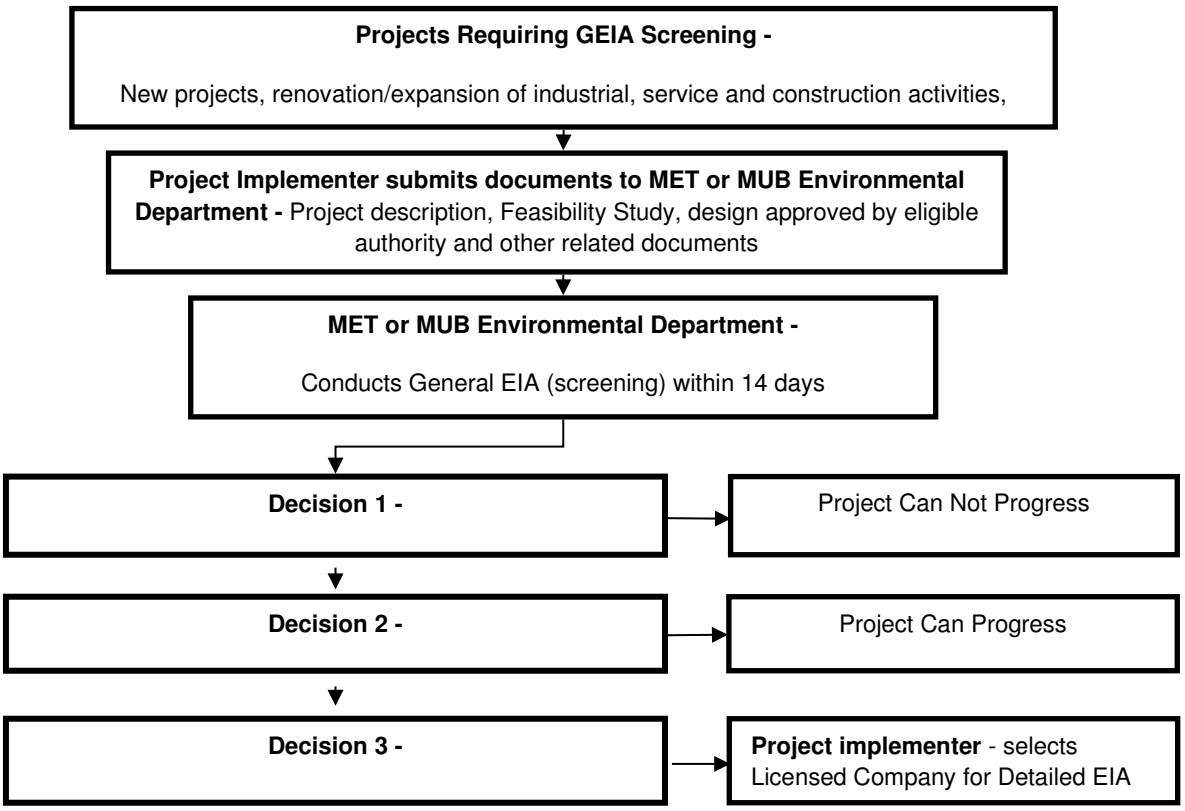
(i) General EIA (GEIA): To initiate a GEIA, the project proponent submits to the MET or Aimag government a brief description of the project, including feasibility study, technical details, drawings, baseline description of the project environment, and a written opinion of the Soum governor. These documents form the basis of the GEIA and MET's assessment, which will have one of three conclusions: (a) project is rejected due to non- conformity with national laws and/or the severity of impacts; (b) project may proceed, subject to specific conditions, and (c) a detailed EIA (DEIA) is necessary. Assessment by MET generally takes 14 working days.

(ii) Detailed EIA. The scope of the DEIA is defined in MET's response for the GEIA. The DEIA is prepared by an accredited national entity. The DEIA is submitted by the project proponent to MET and Aimag government. The reviewer(s) of the GEIA also review the DEIA, generally within 18 working days, and present the findings to the MET. Based on the content of the DEIA, reviewer conclusions, and any additional comments by MET departments, MET issues a decision on whether to approve or reject the project.

[6] Law of Mongolia on Environmental Impact Assessments (1998, amended in 2002). Unofficial translation available from http://cdm-mongolia.com.

[7] The new EIA Regulation revokes 2 Regulations and 1 Guideline document which do not meet the requirements of the EIA Law. The revoked legislation is: Regulation on the Environmental Impact Assessment Committee (2006); Guidelines on Formulating EPPs and EMPs (2000); and Regulation on Detailed EIA Appraisal (2006). These regulations are superseded by the EIA Law.

Figure 4. Environmental Impact Assessment Process in Mongolia



Source: Law on EIA of Mongolia, 2012.

25. The DEIA procedure guide lined by the method approved by the Minister's order A-117 of MET in April 2014 and it is required to contain the following chapters: (i) environmental baseline data; (ii) analysis of extent and distribution of adverse impacts; (iii) measures to minimize, mitigate, and/or avoid impacts; (iv) alternative methods and technology; (v) risk assessment; (vi) environmental management plan (EMP); and (vii) stakeholder consultations, including potentially affected communities.

26. In compliance with Mongolia's environmental safeguard policy, the Tranche 3 is subject to General Environmental Impact Assessment (GEIA)—or environmental screening by the Ministry of Environment and Tourism (MET) or Environmental Department of MUB. GEIA for Tranche 3 was issued by MET in October 2019. The A licensed local EIA firms are hired to conduct the DEIA for Tranche 3 which is expected to be completed in Q1 2020.

27. While the DEIA is a required safeguard document for the government, the document is also helpful to the IEE and environmental safeguards required of the SPS (2009). In particular are the original site-specific environmental baseline information, and analysis of socio-cultural impacts of a project that the DEIA provides. This information is both needed and provides important local context to the IEE.

28. According to the law, the rule approved by the Minister's order A-05 effective from January 2013, the Program shall submit EMP performance report to the MET within November of each year during the construction period as well as getting approval for the next year's plan and associated budget.

4. Environmental, health, and safety standards

29. "Mongolian National Standards" prescribe effluent/wastewater standard, ambient air, noise, water quality, soil quality, industrial effluent discharge, boiler emission, etc.

30. Key standards applied for this project include the following: (i) Water quality general requirement (MNS 4586:1998); (ii) Air quality. General technical requirements (MNS 4585:2016); (iii) Drinking water. Hygiene requirements, evaluation of quality and safety (MNS 0900:2018), (iv) Waste water quality supplied to sanitation network (MNS 6561-2015), (v) Determining disposal location of waste water (MNS 6230-2010), (vi) Occupational hygiene and work condition (MNS 4990-2015), (vii) General Requirements on personal protective equipment (MNS 4931-2000), (viii) General requirement on fire safety (MNS 4244-1994), (ix) General requirement on transportation of domestic waste (MNS 5344-2011), (x) Planning of public utility facilities and distance from green areas (MNS 5973-2009), (xi) General requirement for parking space (MNS 5342-2007) and the WHO Guidelines for Drinking-water Quality, Fourth Edition (2011); (xii) Soil Quality, Soil Pollutant Elements and Substances Standard (MNS 5850:2008); (xiii) Ambient Noise Standard (MNS 4585:2016); and (xiv) Labor safety and hygiene. General requirement for noise level and occupational safety (MNS 5002:2000). The standards for air, water, noise and soils pollution as per Mongolian Standard are listed in Appendix section for reference.

31. Occupational health and safety standard (MNS 5002:2000). Article 16 of the National Constitution of Mongolia states that every employee has the right to 'suitable conditions of work'. The government adopted a National Program for Occupational Safety and Health Improvement in 2001 and national standards are also adopted such as the National Standard on Occupational Health and Safety MNS 5002:2000 which support the Occupational Safety and Health Law 2008 which sets out policies, rules and regulations on occupational safety and health, and the most common requirements for workplace safety.

32. Some the relevant definitions are listed in "The Law on Special Protected Areas – Amendments, Comments and Recommendations" are (Source: Mongolian Law on Special Protected Areas and Law on Buffer Zones by IUCN).

(i) "Article 7. Strictly Protected Areas: Strictly Protected Areas shall consist of those territories taken under state special protection, upon consideration of the preservation status of the original conditions and features of natural zones, in order to represent specific traits of the zones and scientific importance, and to ensure environmental balance.

(ii) Article 8. Strictly Protected Areas Zones 1. Upon consideration of the natural features, characteristics, unique soil, water, flora and fauna, and the human activities involved, Strictly Protected Areas shall be divided into the following zones: 1/ Pristine Zones; 2/ C observation Z ones, and; 3/ Limited Use Zones; Limited Use Zones used in project area: 6/ pursuant to the appropriate procedure, organize eco-travel and tourism according to designated routes and directions 7/ use accommodations constructed pursuant to appropriate procedures and designated for temporary residence, camping, observation, research and investigation by travellers and other people with permission."

33. None of the Tranche 3 subcenters are located within or nearby any SPA buffer zones. The nearest SPA is Bogdkhan mount which is in 3.2 km distance from project sites.

5. Green building concept

34. A preliminary draft of a green building rating system was developed by Mongolia Green Building Council (MGBC) in 2014 by order of the Ministry of Environment, Green Development and Tourism of

Mongolia (MEGDT). The draft system consists of ten main and 26 sub-criteria, covering the four thematic areas of energy, water, environment, and innovation (as shown in Table 10).

Table 10. Criteria of the Mongolia Green Building Council's Green Building Rating System

Energy	Implementation of the requirements of standard criteria of the A, B, C heating/thermal categories specified in BND 23-02-09 - Mongolian Building Standard
	Usage of energy efficient equipment
	Usage of interior and exterior lighting of the building
	Usage of renewable energy sources
Water saving	Water saving equipment installation
	Reuse of grey water futures
	Reuse of rainwater
Environmental aspects	Location: External planning, playground, car parking, bike parking and greenery should be designed according to BND Connectivity to the public transport
	Building: Usage of resource saving building material Usage of Green marked building material
	Interior air quality: Internal air temperature, humidity and noise level according to BND Usage of green labeled material in Interior design.
	Environmental management: Usage of environmental management program and environmental monitoring plan during construction. Construction company or client has ISO 14001 environmental management standard Maximum natural lighting in design.
Innovation	Usage of innovative technology, idea and material not directly related to green building rating system, but incorporated into GBRS

(Source: Mongolia Green Building Council, 2014, report)

6. International conventions signed by Mongolia

35. Mongolia has acceded to a number of international environmental conventions and the key ones are tabulated below under four clusters in Table 11.

36. Each of these conventions places obligations on signatory governments ranging from the provision of a legislative basis for implementation, to adherence to the requirements and conditions of each convention, to monitoring implementation performance on a regular basis, to reporting on a regular basis and to the conference of parties.

Table 11. International Environmental Conventions Signed by Mongolia

No	Convention	Year of Accession	Broadly Relevant to Project
A	Nature conservation		
1	Convention on the Protection of Wetlands of International Importance-Ramsar Convention on Wetlands	1998	No
2	Convention on International Trade in Endangered Species of Fauna and Flora	1996	No
3	CBD (Convention on Biological Diversity)	1993	No
B	Hazardous material		
1	Stockholm Convention on Persistent Organic Pollutants	2004	No
2	Basel Convention on the Control of Trans-boundary	1997	No

No	Convention	Year of Accession	Broadly Relevant to Project
	Movement of Hazardous Waste and Their Disposal		
3	Rotterdam Convention on Prior Informed Consent (PIC) for certain Hazardous Chemicals and Pesticides in International Trade	2000	No
C	Atmospheric emissions		
1	UNFCCC (United Nations Framework Convention on Climate Change)	1994	Yes
2	Kyoto Protocol	1999	Yes
3	UNCCD (United Nations Convention to Combat Desertification)	1996	No
4	Montreal Protocol (on Ozone Depleting Substances)	1996	Yes
5	Vienna Convention for the Protection of the Ozone Layer	1996	Yes
D	World Heritage		
1	World Heritage Convention	1990	No

Note: (a) accession; (e) entry into force; (r) ratification.

B. Asian Development Bank's Safeguards Policies

37. The ADB's Safeguard Policy Statement (SPS), 2009 is applicable to all projects. These projects can be categorized as A, B, or C. Table 12 below provides a list of categorization of the activities related to Environment, Safeguards, as per ADB's Safeguard Policy Statement 2009 requirements:

Table 12. Environment Safeguards Categorization: Definition

Category	Environment	Type of reporting required.
A — Significant	Projects that anticipate significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works.	An environmental impact assessment (EIA) is required to address significant impacts.
B — Less Significant	Projects with potential adverse impacts that are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be more readily designed than for Category A investments.	An initial environmental examination (IEE) is required to determine whether or not significant environmental impacts.
C — Minimal or impact	Projects that have minimal or no adverse environmental impacts.	Environmental due diligence report or any other document that reviews environmental implications is required,

38. At an initial stage of identifying project activities, the ADB's Prohibited Investment Activities List (described below) will apply. If the investment involves a prohibited activity, the implementing agency will not consider the investment. In this project, there are no prohibited activities being undertaken. [8]

7. Asian Development Bank Safeguard Policy Statement requirements (SR1): environment policy

39. ADB's SPS sets out the policy objectives, scope and triggers, and principles for the environmental safeguards. To achieve the policy objectives and deliver the policy principles, ADB carries out the actions described in the "Policy Delivery Process" (subsection "B" of the SPS). To help borrowers/clients and

[8] No production of, trade in, or use of unbounded asbestos fibers.

their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff, through their due diligence, review, and supervision, will ensure that borrowers/clients comply with these requirements during project preparation and implementation.

40. The objective of ADB's due diligence for the Project loan is that the executing agency ensures the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process.

41. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The policy principles for environment assessment are listed in ADB's SPS 2009 document. The Tranche 3 has been evaluated as a Category B Project, requiring an IEE. Guidelines on the ADB's requirements for EIA include the SPS (June 2009).

8. Equivalence of international best policies in infrastructure development

42. The Project is required to meet the ADB SPS guidelines as well as international standards of the IFC, which is part of the World Bank Group. The international environmental and social safeguard policies of these organizations are outlined below.

(i) World Bank Group's Environment, Health and Safety (EHS) Guidelines, 2007.
  (a) IFC (2007) guidelines for asbestos-containing materials (ACM); [9]
  (b) Environmental, Health, and Safety Guidelines for Waste Management Facilities; and
  (c) Environmental, Health, and Safety Guidelines for Water and Sanitation.
(ii) ADB's Environmental Safeguards: A Good Practice Sourcebook-Draft Working Document (November 2012).
(iii) ILO Core Labor Standards.
  (a) Internationally recognized Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products (American Society for Testing and Materials [ASTM] E 2394). [10]

9. Applicable standards, guidelines, and good practices from the Asian Development Bank Safeguard Policy Statement 2009

43. The ADB Safeguard Policy Statement 2009 (SPS) states, "During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects."

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[9] International Finance Corporation. Environmental, Health, and Safety Guidelines, 2007. http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/sustainability+framework/environmental%2C+health%2C+and+safety+guidelines/ehsguidelines.

[10] ASTM International. ASTM E2394-11, Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products. West Conshohocken, PA, 2011. http://www.astm.org/Standards/E2394.htm. This standard describes work practices that protect worker and community health within the resources available in developing and industrialized countries. As much as possible it relies on readily-available tools, equipment, and supplies, and techniques that require careful and diligent workmanship but not the services of highly-skilled tradesmen. The standard is written for construction workers and tradesmen, for those involved in the preparation of contracts and tenders, and for government officials involved in developing regulations to protect worker and community health.

44. National regulations take precedence; but when they differ from the EHS Guidelines, the more stringent levels or measures apply. In some circumstances, less stringent levels or measures may be appropriate due to specific project conditions (e.g., existing facilities). In these cases, the borrower/client is required to prepare alternatives that are consistent with SPS requirements for the protection of human health and the environment. Full and detailed justification of the proposed alternatives should also be provided.

III. PROJECT DESCRIPTION

A. Overview

45. The Tranche 3 aims (i) community to have a development vision (based on lessons learned from Tranches 1 and 2); (ii) to connect Sharkhad in east and Tolgoit in west to existing subcenters to create network; (iii) to contribute the spatial restructuring and urban infrastructure provision in Tolgoit and Sharkhad, remote ger areas to stimulate the community subcenters development as a residential hub of the west and east industrial area of the city; (iv) to improve community access to urban and economic services as well as improve surface water protection and ensure the safety of the area; (v) to deliver socio economic facilities; (vi) to complete the targeted investments under Tranches 1 and 2; and (vii) to support institutional strengthening and capacity building.

46. **Impact and outcome.** The impact of Tranche 3 will improve living conditions in remote east (Sharkhad) and west (Tolgoit) ger areas of the Ulaanbaatar. The outcome is a network of livable, competitive, and inclusive community subcenters in Ulaanbaatar's remote ger areas.

47. **Outputs.** Tranche 3 will have three outputs:

(i) Roads and urban services are expanded within priority subcenters, and connectivity between them is improved;
(ii) Economic and public services in targeted areas are increased; and
(iii) Institution and capacity are strengthened.

48. **Projected Population Growth.** The Tranche 3 sites are located in the most populated districts of Ulaanbaatar city. The boundary for the selected subcenters is greater compared to subcenter sites under Tranches 1 and 2. The reason for selecting bigger area/boundary of subcenter is mainly to utilize economic opportunity and reconcile surrounding landscape and land use for greater growth of the area with higher density and diverse economy. The investment of the ADB will not only drive the private sectors to invest in this area, but also give MUB an opportunity to develop more attractive business projects by optimizing other financial resources. The proposed developments are aligned with the UB city master plan.

49. The proposed development plan encourages densification, almost by three times by providing better public services and utilities through participation of the communities and the private sector. The high to medium densities and mix land use that will maximize land efficiency, reduce the cost of infrastructure, facilitate the operation of a viable public transport system, and reduce the environmental impact of urbanization.

50. Both the Mongolian and Ulaanbaatar populations are predicted to grow in the future. According to the National Statistics Office (NSO), the Mongolian population will grow by an annual rate ranging between 1.5% and 2.16% during the next 25 years10F10F11. Despite a somewhat slowing of this rate,

[11] http://1212.mn/BookLibraryDownload.ashx?url=hetiin_tootsoo_2017_mongolia.pdf&ln=Mn.

a very reasonable amount of growth will be observed in the long term. Compared to the national growth rate, Ulaanbaatar city will grow at greater rate and based on the same prediction made by the NSO. Ulaanbaatar will grow by 3.67% during 2015–2025, 2.42% during 2025–2035 and 2.25% during 2035–2045. This aligns with the global urbanization trend, where rural populations migrate to the urban centers for better economic opportunities and access to public services. Also, for population projection considers influx of population due to investment in infrastructure provision and land use planning.

51. Analysis of population projections for the two subcenters is done based on khoroo statistics data of population. Low growth, medium growth and high growth scenarios were considered based on the research and summary data is shown in Table below.

Table 13. Projected Population and Density of Project Area and Subcenter

Subcenter name	Location	Area (Ha)	2018 Population	2018 Density (pp/ha)	Projected population		Projected Density 2040
					2030	2040	
Sharkhad	ADB Project area	124	8,939	68	19,742	26,532	214
	Subcenter area	507	32,395	64	56,708	76,210	150
Tolgoit	ADB Project area	153.4	6,860	45	14,962	21,105	138
	Subcenter area	737	18,545	25	37,126	62,564	85
TOTAL	**Project area**	**277.4**	**15,799**		**34,704**	**46,935**	
	Subcenter area	**1,244**	**50,940**		**93,834**		

52. The current density of Sharkhad is 68 person/ha and the projected high growth scenario yields 214 person/ha density in 2040. Tolgoit subcenter has lower density than Sharkhad at 45 person/ha, which will reach around 138 person/ha under the high growth scenario by 2040. Without deification in both locations, economic and environmental benefits will not be achieved. UN-Habitat recommends a density of at least 140 person/ha [12] to achieve a sustainable neighborhood. It summarizes the benefit of density as the following:

(i) Lower public service cost due to economies of scale achieved through density;
(ii) Better community service and stronger community impact;
(iii) Possibility to achieve effective public transportation;
(iv) Lower infrastructure investment cost per household;
(v) Increase accessibility within the region, as both centers are nearby job area/industrial zone of MUB; and
(vi) Increased energy efficiency and decreased pollution. [13]

53. The subcenter development proposals are based on:

(i) Assumption - that the Population Growth pattern (e.g., rate of growth) will not vary significantly from that adopted now;
(ii) Aim - to tackle urban decline, reduce the use of greenfield land, and limit urban sprawl and to improve the quality of design of the built environment; and

[12] UN-Habitat and International City Leaders 2015.
[13] https://unhabitat.org/wp-content/uploads/2014/05/5-Principles_web.pdf.

(iii) Rationale - to achieve a functional balance between residential areas, community facilities and employment centers and increase per capita living space.

54. The planning proposals related to population density, land use, planned development, provision of infrastructure and services and governance have been developed for the two subcenter areas and. The table below presents the existing status, proposed development and potential benefits of the planning for Tolgoit and Sharkhad subcenters.

Table 14. Existing status and proposal for planning of Tolgoit and Sharkhad subcenters

Sl	Current Status of Tolgoit and Sharkhad	Proposal	Benefits
1	Low residential density	Medium to high residential and employment densities	• Efficient usage of scarce Land • Increased social interaction leading to safety • More circulation, open and green space
2	Spatial concentration and segregation of different types of land use	Mixture of land use	• Reduces travel time between workplace and home • Saves per head travel cost
3	Unplanned and uncontrolled development	Contained urban development	• Low wastage of precious land • Protection of ecological diversity • Quality living
4	Insufficient infrastructure	Strong urban infrastructure	• Savings in per-capita spending on infrastructure
5	Inadequate circulation and accessibility	Comprehensive road network	• Improved access and reduced traffic • Efficient and fast movement
6	Fragmentation of governance authority	Unitary control of planning development	• Faster execution of planned development

55. Beneficiaries of the Tranche 3. There are mainly two levels of beneficiaries (direct and indirect) of the project. The project has defined two boundaries (i) project area (planned for investment under Tranche 3), and (ii) subcenter area (bigger area to be developed by MUB later in phased manner). The direct beneficiaries are the one within ADB project area boundary while the indirect beneficiaries are the one within subcenter boundary and beyond i.e., within Khoroo. The infrastructure provided by the project are designed considering public recreational and economic improvement perspectives as well as infrastructure expansion and connectivity. The indirect project beneficiaries would be in the subcenter boundaries and broadly neighbored residents in the region. Expanded capacities of water supply reservoirs, pump stations and newly constructed utility pipelines will enable the MUB to connect the neighboring areas to utility lines in the future. Sharkhad subcenter located in the eastern Ulaanbaatar zone where the ADB project area is covering parts of project area of Khoroo 9, 17 while the subcenter covers 9,17,19, 22, and 24 khoroos in Bayanzurkh district. The ADB project area spreads over an area of 124 hectares while the subcenter area spreads over an area of 507 hectares. ADB project area has 8,939 population while the subcenter area has 8,721 households with roughly 31,395 residents. Regarding Tolgoit subcenter, it is located in the western part of the city covering parts of Khoroo 1, 2, 3, and 22 in Songinokhairkhan district while the ADB project boundary covers parts of khoroos 1 and 2. The Subcenter area spreads over 737 hectares while the ADB project area spreads over an area of 153.4 hectares. The Tolgoit subcenter has population of approximately 5,010 households with 18,505 persons, out of which 1,846 household with 6,860 people reside within the ADB project boundary.[14]

56. The project proposes to develop one Kindergarten (240 children), and one Community Development Center and one Business Incubator for each subcenter. Further one Sports Complex in Sharkhad and one Health Facility in Tolgoit is proposed. In total 480 children will get direct benefit from the social facilities in Tolgoit and Sharkhad. With the limited recreational and cultural facilities at the site,

[14] Calculated by T2-CS02 Consultancy team based on the information provided by District.

the sports complex and community center will likely to provide services to wider community beyond the subcenters. Approximately 50,940 residents within both subcenters are likely to receive direct benefits of project on a daily basis and indirect beneficiaries would include around 142,452 people. However, the subcenter population is expected to observe induced growth due to investment in infrastructure and facilities. As a result, direct beneficiaries are likely to reach over 138,774 numbers by 2040. Whereas, the indirect beneficiaries are expected to be around 285,967 people by 2040, altogether in both subcenters (refer to table below).

Table 15. Total Beneficiaries

	2018			2040		
	Khoroo	Subcenter area	Project area	Khoroo	Subcenter area	Project area
Sharkhad	84,502	31,395	8,939	155,141	76,210	26,532
Tolgoit	57,950	18,505	6,860	130,826	62,564	21,105
TOTAL	**142,452**	**49,900**	**15,799**	**285,967**	**138,774**	**47,637**

B. Existing infrastructure at the subcenters

1. Existing road network

57. The rate of vehicle registration has been increasing as the influx of the population has been increasing in Ulaanbaatar. This has resulted the traffic congestion and increase in the cost and time of the commute in Ulaanbaatar. Various projects are suggested in order to solve this problem, including BRT Investment Program, Metro Project, Street Project (Interchange upgrade, Ger area development, etc.). These improvements in the transport system aim to efficiently integrate the city center and subcenter including Ger areas.

58. Therefore, it is important to nominate the areas connecting to the center of the city that has potential to develop the economy of Ulaanbaatar for the nomination of subcenters in the feasibility study. Road network in the subcenter is required to be planned to ensure the connection with the existing road system and promote continuous development. This approach should correspond to the current Master Plan of Ulaanbaatar 2030 and distribute the concentrated traffic from the main road by improving nearby roads.

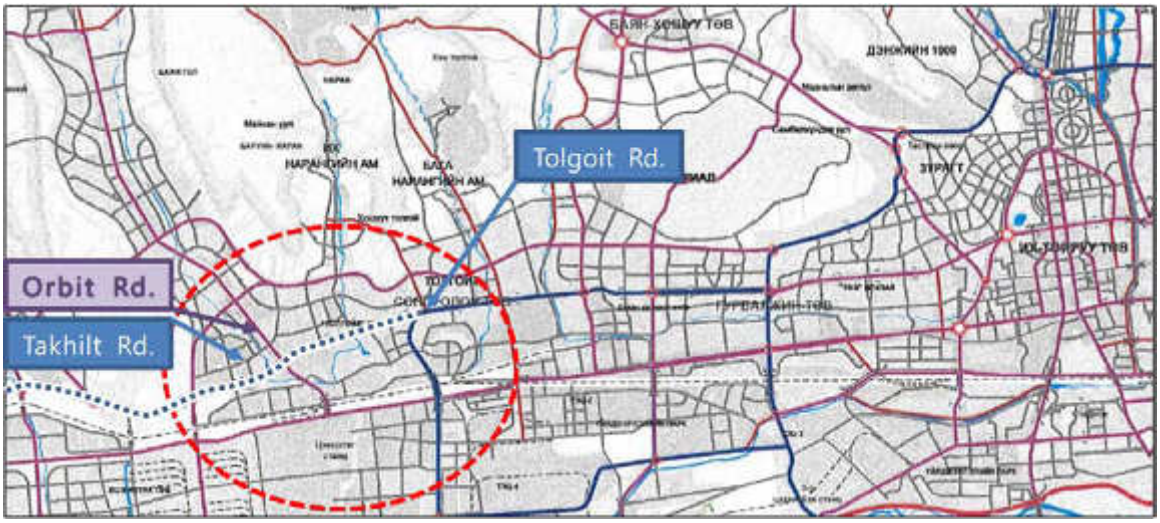
i. Tolgoit subcenter

59. Geographical characteristics in Tolgoit is categorized as mountainous areas in the north and low altitude area in the south and in the north south direction. While in the east it is low altitude and moderate altitude in the east west direction. Stream that has been formed by the natural water flow in the northern area according to these geographical characteristic goes through Ger areas.

60. Main facilities in Tolgoit area includes the military base in the west, Mongolian National Data Center (Telecommunication Center) in the central zone, and residential areas in the east. Inner area and roads have been arranged appropriately in the east area as it is closer to CBD while development has been slow in the west area since it has facilities that are difficult to be relocated. Road plan has been

reviewed according to UBMP 2030 as the subcenter master plan has not been prepared for Tolgoit area (Refer to Figure 5 below).

Figure 5. Road plan of UBMP 2030



Source: UBMP 2030 map, on-top drawing by consultant.

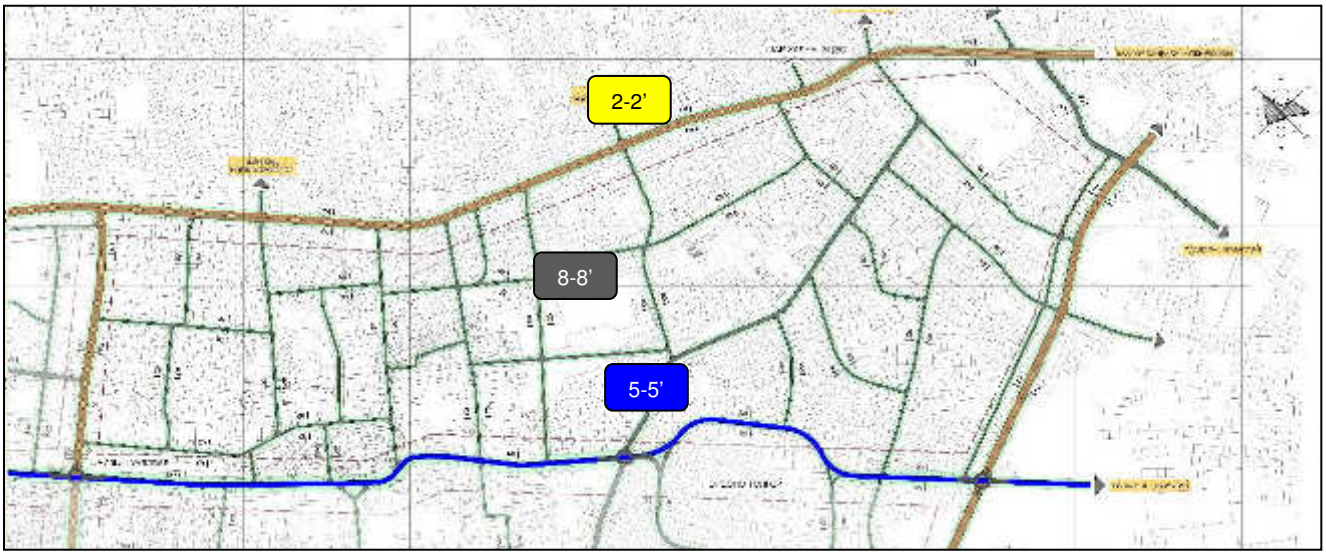
61. The Blue route shown in the above figure is classified as Main Road Grade 1, which is not connected to Tolgoit Road and considered to be included in this project. However, this route is a plan to divide the National Data Center, which has not been planned to be relocated, so this route needs to be changed. The other purple line to the east-west direction, the northern purple line, is classified as Main Road Grade 2, which is the boundary of the area and is planned to use the existing unpaved roads in the ger area.

62. Other roads inside the Ger area are mostly unpaved roads which are near the natural water course are not suitable for driving. Moreover, during rain there is water logging and the roads become marshy In order to improve this, it is necessary to install flood protection facilities for separate roads from waterways.

ii. Sharkhad subcenter

63. Sharkhad subcenter master plan has a road plan with two major axes in east-west direction at upper and lower parts of the subcenter as well as roads connecting north and south at eastern and western border respectively. The exterior axis is planned to be connected with four-lane road and internal roads are planned with two-lane. According to road classification of the master plan, typical cross sections are proposed and shown in Figures 7–9.

Figure 6. Road Plan of Sharkhad Master Plan

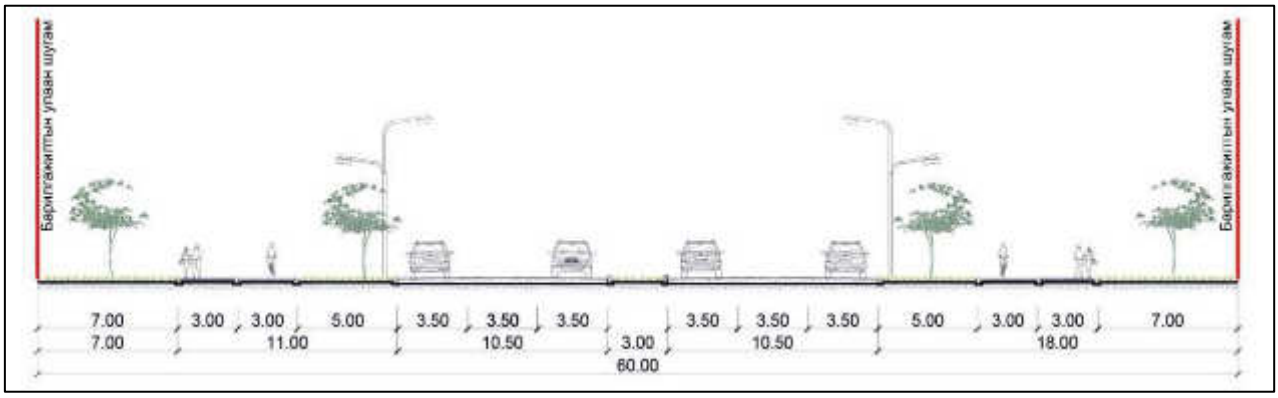


Source : Partial master plan of 17th sub-district, on-top drawing by consultant.

Table 16. Classification of Road in Sharkhad

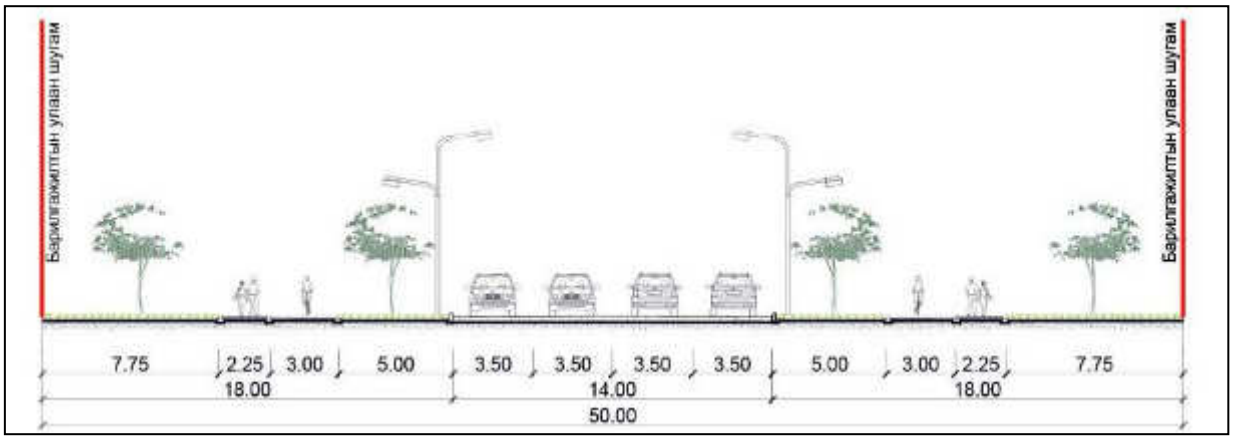
Road name	Classification
Blue Line (Section 5-5')	Main Road Grade 2
Yellow Line (Section 2-2')	Main Road Grade 2
Gray Line (Section 8-8')	Local Road Grade 1

Figure 7. Typical Cross Section of Road in Master Plan (Section 2-2')



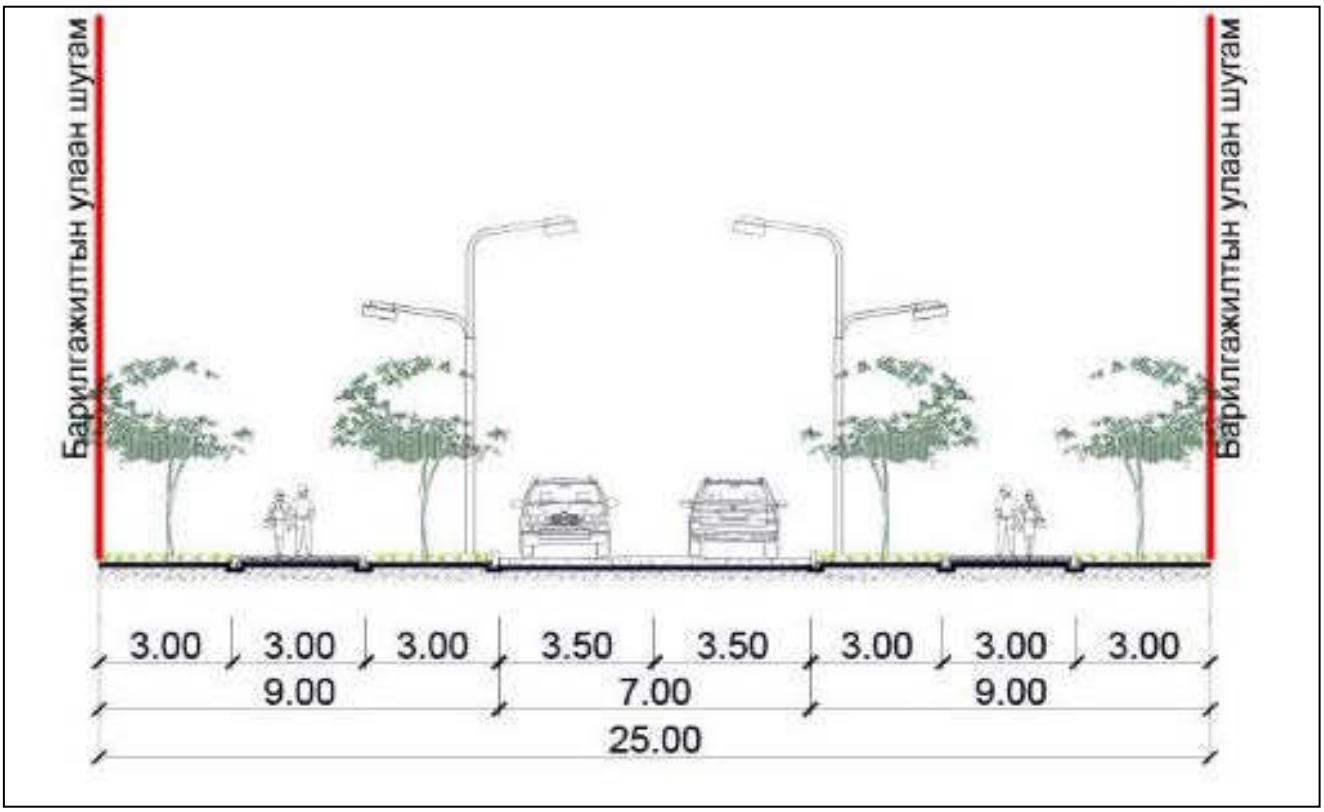
Source : Partial master plan of 17th sub-district, on-top drawing by consultant.

Figure 8. Typical Cross Section of Road in Master Plan (Section 5-5')



Source : Partial master plan of 17th sub-district, on-top drawing by consultant.

Figure 9. Typical Cross Section of Road in Master Plan (Section 8-8')



Source : Partial master plan of 17th sub-district, on-top drawing by consultant.

64. Main facilities in Sharkhad area include Gazarchin University, Construction Material Market and Driving Training Course in the west and State Mental Hospital and Car market which area distributed widely in the east. This area has widely distributed vehicle service centers as they are connected to the Car Market. The main access roads are the main roads of areas in north and south, where 1.9 km road in the south are operated as four-lane with asphalt pavement and 3.3 km four-lane road in the north are reflected in UBMP 2030 for future plan. Pedestrian roads are installed in the operated roads, however

street utilities such as streetlight and road signs interfere with pedestrians. Most roads in Sharkhad Ger area are in poor condition with limited accessibility and mobility.

65. Ger areas which are settled according to the geographical condition do not have variable road alignment and width, and mainly have unpaved road except for some roads close to the main roads. There is very little drainage facilities along the road network, which is a consequence of the low rainfall in the country.

66. Thus, road drainage in Ger area mostly flows through natural water courses, which led to the loss of aggregates of road. This results in an uneven road surface and its muddy, icy and unstable condition, which led to poor mobility of vehicles (Refer to Figure 10).

67. In some roads, there are high accident risks due to damaged pavement (potholes, crack unsealed etc.) or exposed manhole on road due to no maintenance. Though, LED streetlights are installed in Ger area, they are not widely installed and also a few of those streetlights is badly-installed due to poor ground condition.

Figure 10. Current Condition of Sharkhad

2. Existing water supply network

68. As a result of assessment on the current condition of water supply system in Ulaanbaatar city (Refer to Figure 11), there is a total of seven water sources (shown in Table 17) in the city and their approved total capacity is 258,000 m^3/day as of 2015, however currently 160,000 m^3/day (61.8%) of total capacity is underserviced, in accordance with the documents from USUG. Ulaanbaatar city`s Central water supply network is the system that supplies the water through the water supply network connected with four main water sources. Currently, a project is under the implementation for connecting the Upper and Gachuurt sources to it.

Table 17. Production of Well fields (m^3/day)

Well fields	Estimated sources, m^3/day		Water Consumption m^3/day	Exploitation of well field production, %
	1980	2015		
Central	90,700	93,840	55,000–58,000	58.6
Industrial	30,300	16,027	21,000–23,000	131
Meat source	8,800	8,019	10,000–12,000	124.7
Yarmag	20,000	20,000	350–450	1.75
Upper source	89,300	73,353	48,000–51,000	65.4
Gachuurt	25,200	25,200	10,000–12,000	39.7
Buyant ukhaa	22,500	22,500	3,600–4,000	16
Total	286,800	258,939	148,000–160,000	57.2–61.8

Source: USUG

Transmission and distribution system

69. Under the UB City organizational structure, USUG is mainly in charge of the production of the water resource and operates a network composed mainly of transmission and distribution mains totaling 586 km and six booster pump stations as well as nine transmission pump stations. The water supply system in current Ger areas is not connected fully with the central water supply network, but the water is supplied by the kiosk or portable water distributor.

70. There are eight existing kiosks in Sharkhad area and six existing kiosks in Tolgoit area that serve as water distributing points for the respective area residents. Even though water supply pipelines are constructed in the area within the project, these kiosks might still be operating until all households in the area are connected to centralized water supply lines. All of the kiosks are owned and operated by USUG who will make decision on whether these kiosks will be demolished in the future. But such decision will be made only after every household in the area is connected to centralized water supply lines.

Table 18. Capacity of Water Supply Systems of Ulaanbaatar City

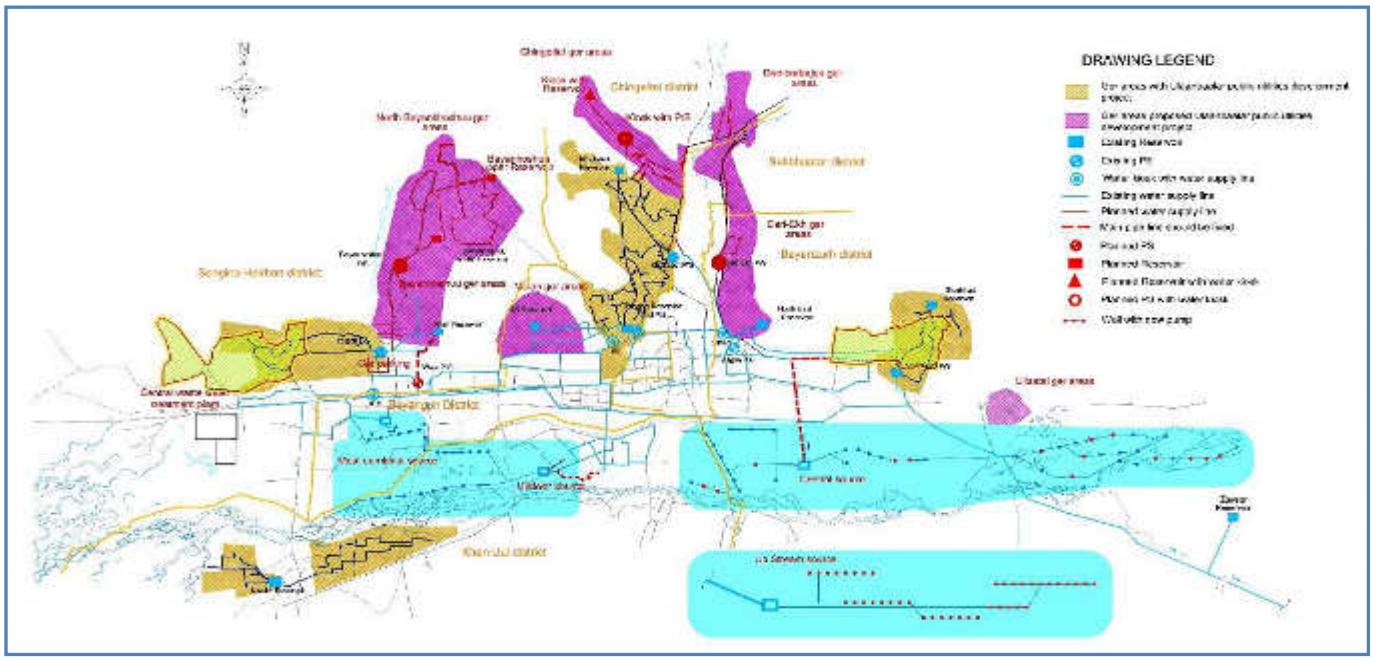
Capacity of reservoirs	Reservoirs as water sources	30,100 m^3 for 7 positions
	Reservoirs for water distribution	51,000 m^3 for 12 positions and total 81,100 m^3
Second booster pump stations		6
Transmission pump stations		9
Deep wells		218
Lengths of water supply pipelines		586 km
Water kiosks in Ger areas		Connected with pipeline
		Transporting

Source: USUG

71. The following projects will be implemented and completed by state and capital city investment in the coming years:

(i) Water supply pipeline DN300-DN600 with length 14 km and water reservoir, pumping station in Bayangol upper district;
(ii) Water supply pipeline DN150-DN300 with length 15 km in New Yagrmag district;
(iii) Water supply pipeline DN300 with length 3.4 km of Ireedui district; and
(iv) Water supply pipeline DN300 with length 4.5 km, water reservoir, pump station of Urgakh Naran district.

Figure 11. Main Water Supply Networks in Ulaanbaatar

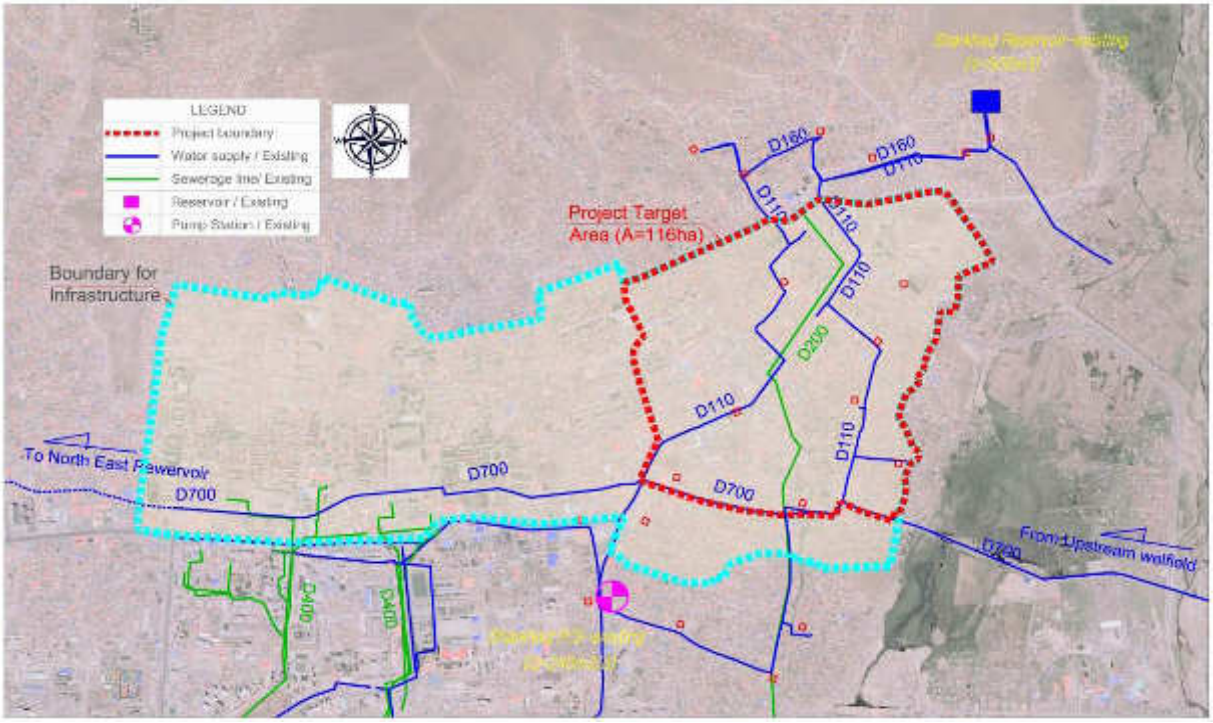


Source: USUG

i. Outline of the water supply system in Sharkhad

72. The water system in Sharkhad, which was developed by the World Bank, is able to supply water to about 7,917 general householders. In this area, existing network as D110, D160 mm with length of 9.0 km is existed. Distribution to the end users as householder is conducted by water kiosk. Currently, the kiosks are installed at totally eight places, and six places among them are connected with the water supply pipelines and the other two places are operated by truck (Refer to Figure 12).

Figure 12. Location Map



Reservoir

73. Sharkhad reservoir is being filled through Sharkhad pump station. Distribution to the end user is conducted by water kiosk. The reservoir storage capacity is 500 m^3 (Refer to Table 19).

Table 19. Distributing Reservoir of Sharkhad

Name	Volume (m^3)	Elevation (m)	Shape	Size (m)	Installation year	Remarks
Sharkhad Reservoir	500 m^3	1391 m	Circular	D = 12 m H= 4 m	2005	

Figure 13. Sharkhad Reservoir

Pump Station

74. There are two booster pumps and one circulating pump installed at the Sharkhad pump station, and they are being operated for 24 hours with alternation of operation and stand-by (Refer to Table 20).

75. Water inflow is from the 600 mm inlet pipe is pressurized through a booster pump and supplied to two 110 mm plastic pipes. While the remaining water is stored in the Sharkhad reservoir, water is supplied to the areas at peak time by gravity flow method. Therefore, the existing water supply method of Sharkhad use both direct and indirect method.

Table 20. Outline of Sharkhad Pump Station

No.	Installation year	Pump type	Capacity (m^3/day)	Head (m)	Power (kW)	Remarks
1	2005	Vertical	240 m^3/day	114.4 m	5.5 kW	1 Circulation Pump is equipped
2	2005	Vertical	240 m^3/day	96.7 m	4 kW	

Figure 14. Sharkhad Pump Station

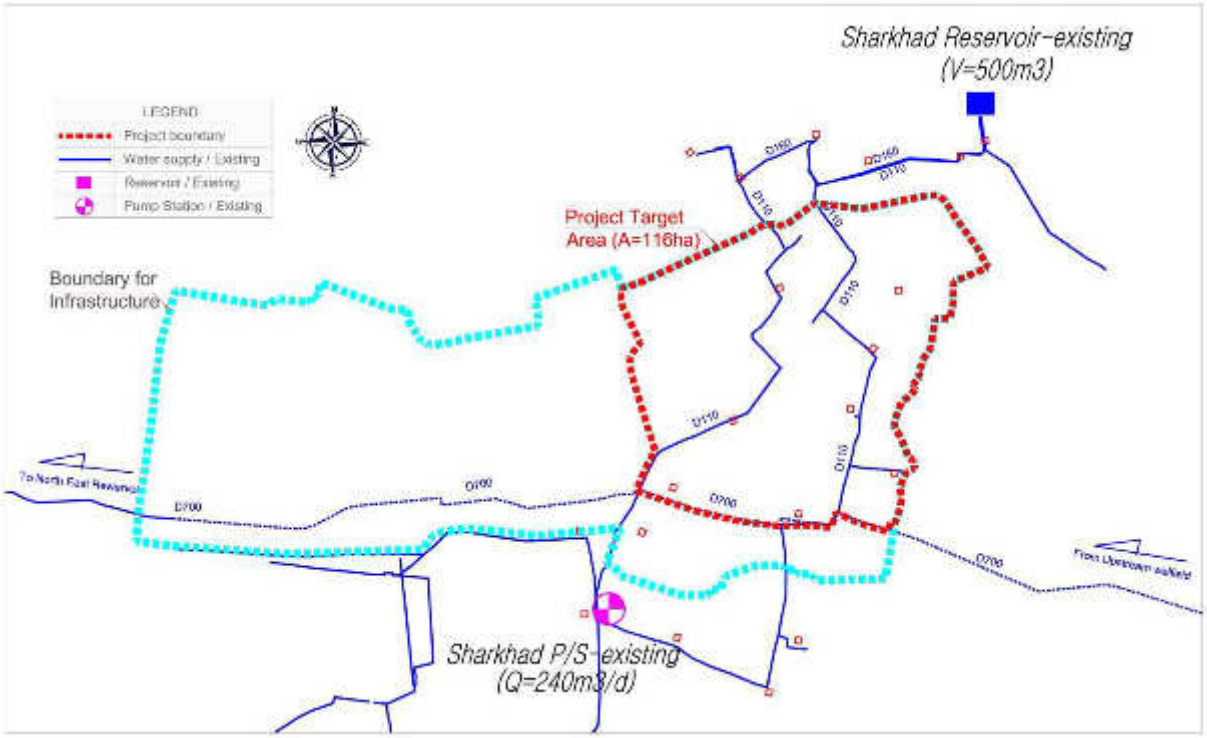
Outside View of Pump Station

Internal View of Pump Facilities

Distribution pipeline network (Sharkhad)

76. For existing water supply pipe is installed in the project area with diameter of D110~160 mm and length of 9.0 km. This water supply pipe connects Sharkhad Pump Station and Sharkhad Reservoir, and composed as the distribution pipeline with network form. They were installed in 2005, and their types are cast-iron pipe and HDPE pipe. Furthermore, 700 mm GRP pipe crosses the project site from east to west and directly connects this pipe and planned pipeline which allows the water supply to the Central water service (Refer to Figure 15).

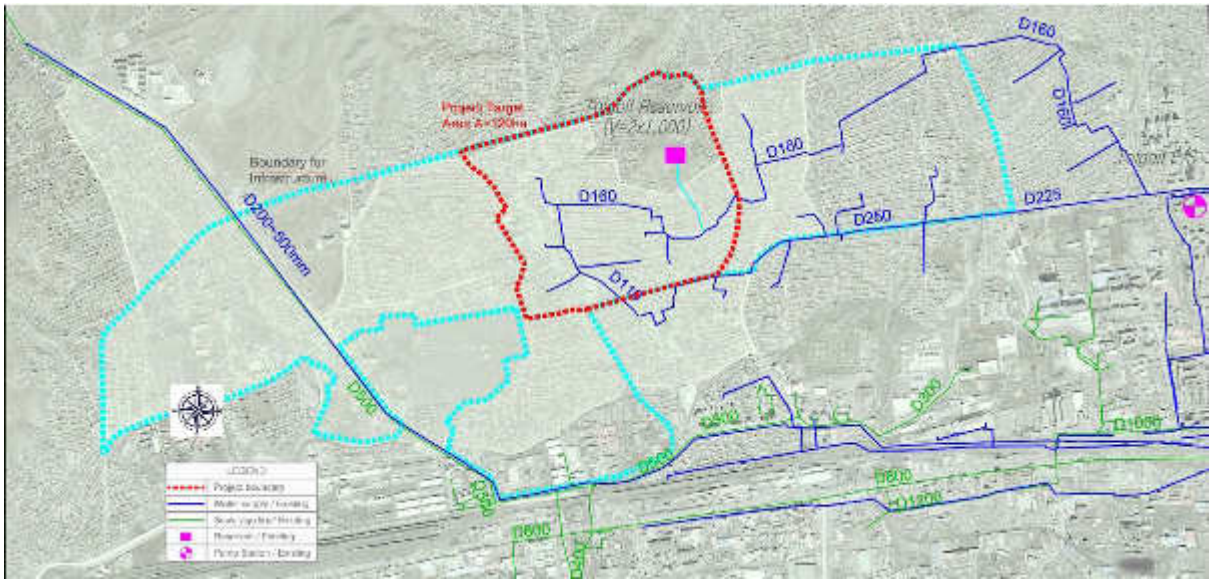
Figure 15. Distribution Pipeline Network (Sharkhad)



ii. Outline of the Water Supply System in Tolgoit

77. The existing water supply network of Tolgoit project area are categorized into the areas that supply water pressurized by the Tolgoit Pump Station(288 m^3/h) booster pump and areas that supply by directly connecting to the main water service. Furthermore, more sustainable water supply will be possible if Tolgoit Reservoir (V = 1,000 m^3) is installed which was planned by MUB (Refer to Figure 16).

Figure 16. Outline of the Water Supply System in Tolgoit



Reservoir

78. Tolgoit Reservoir will be constructed with a budget of MUB and is planned to commence in 2020. The capacity of the facility is 2 x 1,000 m^3 and is planned to be installed in Tolgoit 2-xoroo area, and will be directly connected to Tolgoit Pump Station supply network (Refer to Table 21).

Table 21. Outline of Tolgoit Reservoir

Name	Volume(m^3)	Elevation(m)	Shape	Installation year	Remarks
Tolgoit Reservoir	1,000 m^3	1352 m	Circular	2020	MUB budget

Pump station

79. Tolgoit is situated on the Western part of the city and is the last ger area supplied by the city network for the moment. It is supplied by Tolgoit pump station at 1,285 m AMSL. The water comes from West reservoir via a ∅ 400 pipe.

80. The pump station in Tolgoit has four pumps. The average capacity of each pump is 900 to 1300 m^3 per day, which works 24 hours (Refer to Table 22).

Table 22. Outline of Tolgoit Pump Station

No.	Installation year	Pump type	Capacity (m^3/day)	Head (m)	Power (kW)	Remarks
1	2004	Vertical	768 m^3/day	59.1 m	7.5 kW	
2	2004	Vertical	768 m^3/day	59.1 m	7.5 kW	
3	2004	Vertical	1536 m^3/day	60.4 m	15 kW	
4	2004	Vertical	768 m^3/day	59.1 m	7.5 kW	Stand by

Figure 17. Tolgoit Pump Station

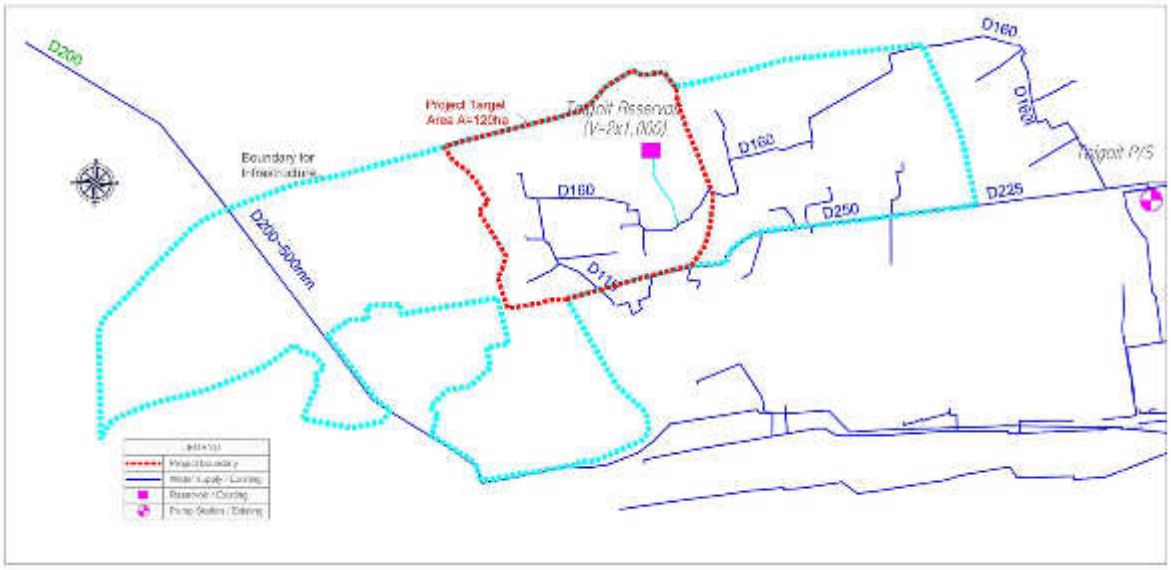
Outside View of Pump Station

Internal View of Pump Facilities

Distribution pipeline network (Tolgoit)

81. Existing water supply pipe located nearby the project site have diameter of D110~250 mm and length of 12.9 km, and is connected to Tolgoit Pump Station. This water supply pipe connects Tolgoit Pump Station and Tolgoit Reservoir, and is composed as two separate supply pipe with network form with structure that circulates according change in the water pressure and water usage amount. Whereas the west side of the project site has pipe installed with diameter of D200 mm and length of 3.4 km which supplies part of required water to the limited areas (Refer to Figure 18).

Figure 18. Distribution Pipeline Network (Tolgoit)



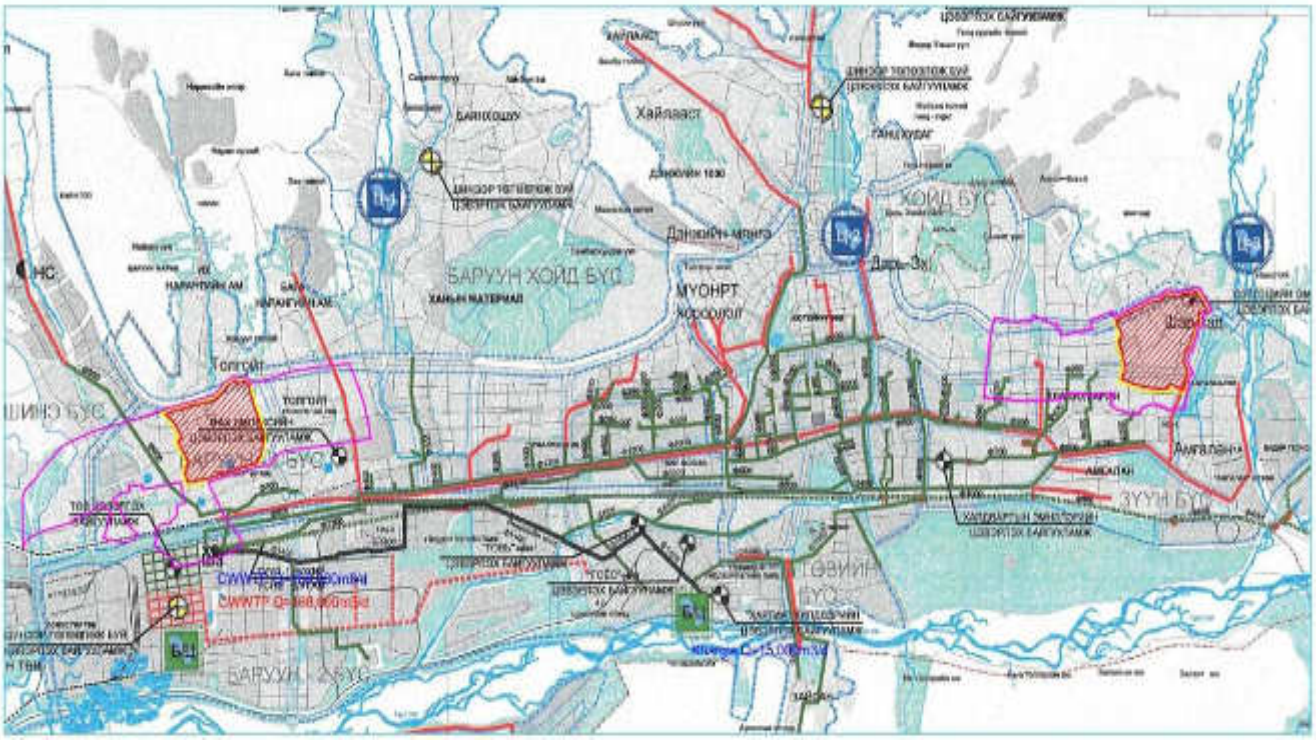
3. Existing sewerage network

82. In order to create a healthy and safe environment in Ulaanbaatar,there were technological upgrades for wastewater treatment through the planned sewerage system (Refer to Figure 19).

83. The planned upgrades are:

(i) Ulaanbaatar's total wastewater treatment capacity will be increased up to 266,721 m^3/day.
(ii) New bio-and nano-advanced technology will be introduced in the central wastewater treatment
(iii) plant and the plant capacity will be doubled.
(iv) A new wastewater treatment plant will be built in Yarmag (with the capacity of 82,512 m^3/day) and another one in the new city center as well.
(v) New Tuul-1 and Tolgoit-1 central collectors and a 7.8-km sewer pipeline in the Nisekh-Yarmag area will be built.

Figure 19. Layout of the Main Sewerage Networks in Ulaanbaatar



Source: UBMP 2030 (2013), project area in Tolgoit and Sharkhad added by the consultant

- **Outline of the sewerage system in Sharkhad**

84. As the Figure 20 shows pipe with D200 mm 2.9 km long is installed in 2018 at the east side of the planned site and currently as of year 2019 is being prepared for operation, and there are no sewer pipes connected to the sewer system in the west side. There is main collector with D400 and D800 mm installed at the south of outside of the project site, and sewer can be discharged with gravity flow when it is connected to planned sewer pipes.

Figure 20. Location Map of System in Sharkhad

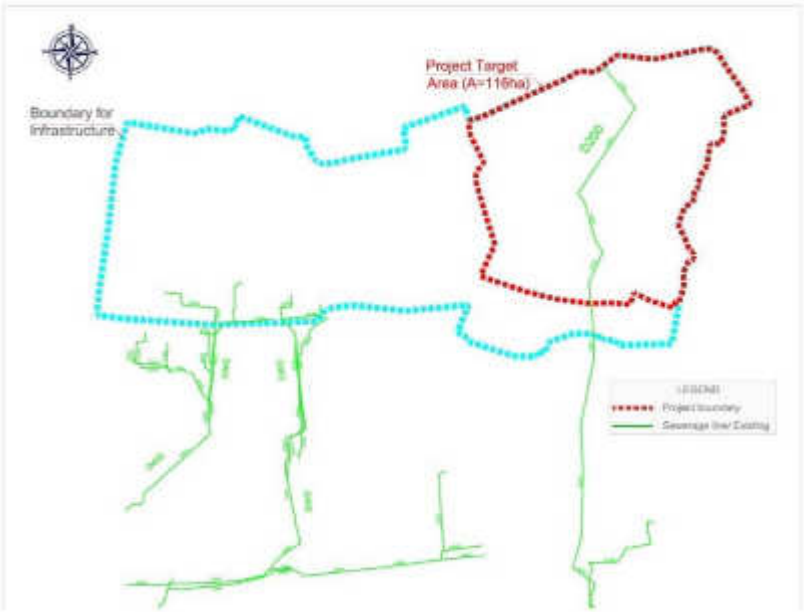


Table 23. Planned Sewerage System In Sharkhad

№	Description	Phase	Location Map
1	16th residential area distribution pipe, start of 1st collector/ф400 mm, length 821 m/	Design and cost estimates were made at the request of the City Investment Department in 2018.	
2	Reconstruction of 1st collector/ф600 mm, length 445.8 m/	Design and cost estimates were made at the request of the City Investment Department in 2018.	

- **Outline of the Sewerage System in Tolgoit**

85. There is almost no sewerage system installed in the Tolgoit project site, and there is pipe installed with D200~600 mm of 4.4 km in certain area which discharged limited amount of sewer from certain areas in the west side. Furthermore, the main collector (D 500 mm) is installed at 800 m away from the border of the project site, which can discharge sewer by gravity flow when it is connected to the planned sewer pipe (Refer to Figure 21 and Table 24).

Figure 21. Location Map of Sewerage System in Tolgoit

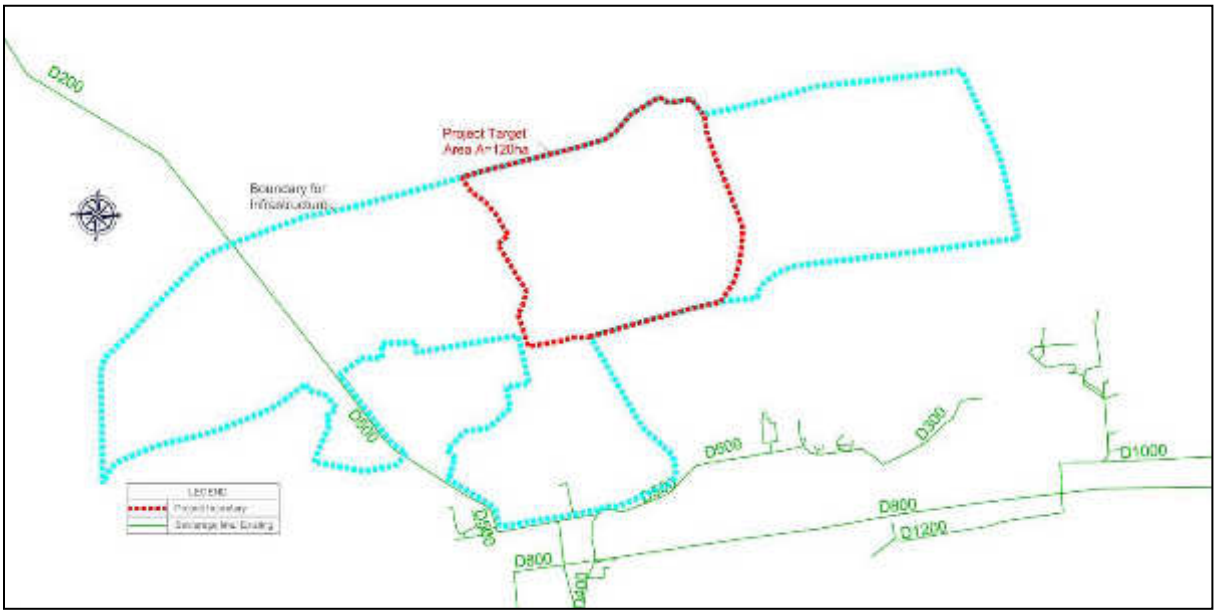


Table 24. Planned Sewerage System In Tolgoit

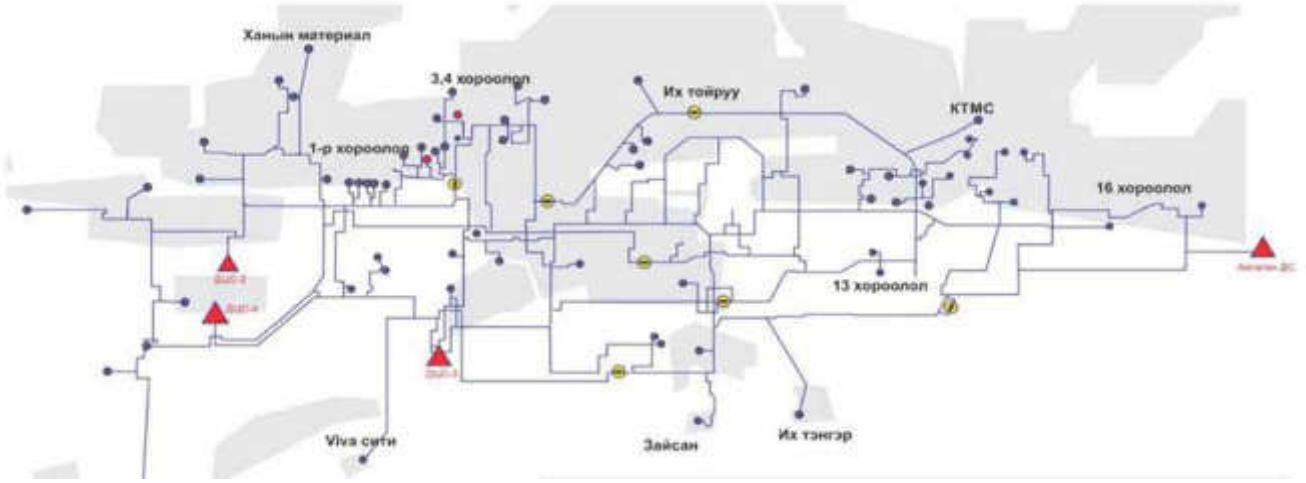
№	Description	Phase
1	Orbit Ger areas distribution pipe /ф300 mm, length 2669 m/	Design and cost estimates were made at the request of the City Investment Department in 2014.
2	Tolgoit collector /ф300-1000 mm, length 5171m /	Design and cost estimates were made at the request of the City Investment Department in 2012. Pipelines with a size of ф300-800 mm and a length of 1223 m were built in 2017-2018 and temporarily connected to the 35th collector. Requires to build the remaining pipelines.
Location Map		

4. Existing heating supply network

i. Overview of the Ulaanbaatar district heating system

86. The heating system in Ulaanbaatar is extensively summarized into two ways: (i) the CBD and newly developed Southern part of Ulaanbaatar with a gentle slope compared to the Northern ger area, are supplied by the central heating distribution network (District Heating System); and (ii) ger area scattered in the Northern area of Ulaanbaatar city, where 60 % of Ulaanbaatar population reside, has a high elevation point compared to the CBD, which restricts the heat supply. Ger areas rely on small “heat only” low-pressure boiler plants for public and institutional facilities while residential heating is run by coal/wood-fired stoves which contribute to severe air pollution that affects the entire city.

Figure 22. Ulaanbaatar District Heating Network



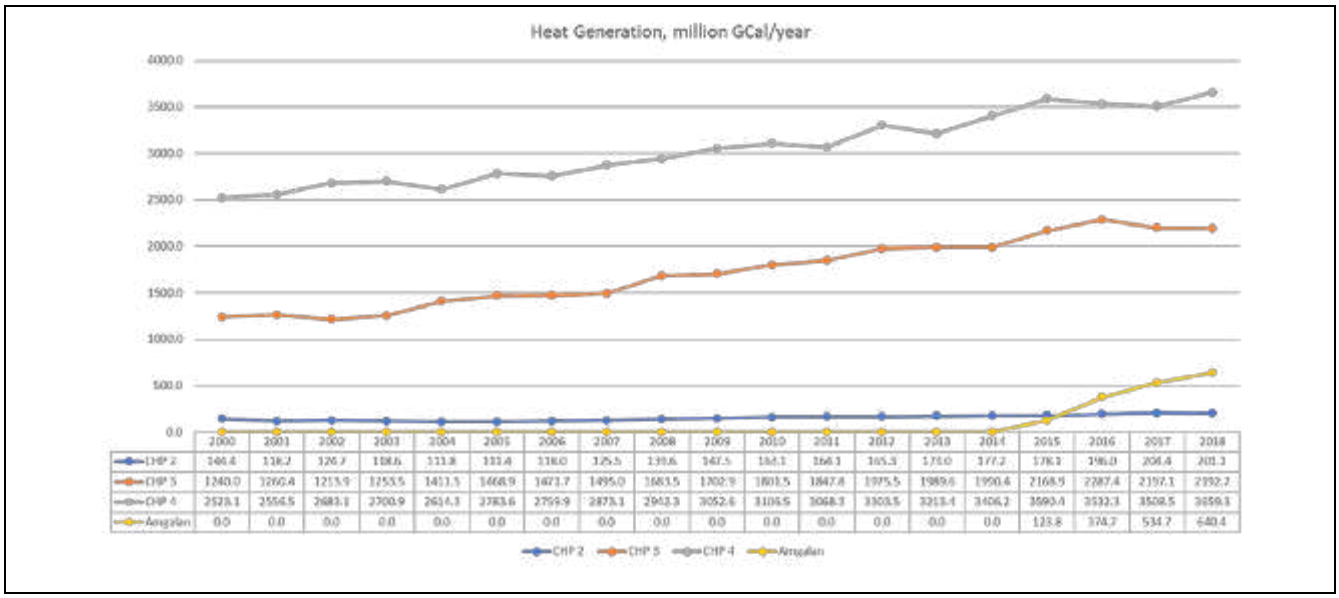
87. Currently, the majority of District Heating services in Ulaanbaatar are provided by two companies:

(i) Ulaanbaatar District Heating Company owned by the Ministry of Energy, Ministry of Finance and the State Property Committee, transmits purchased heat through an extensive network of large diameter pipelines to central heating substations and a small number of directly connected consumers; and
(ii) Housing and Public Utilities of Ulaanbaatar City, owned by the UB, purchases the majority of heat from UBDH and distributes it to consumers.

88. In addition to the above, the three combined heat and power plants (CHP 2, CHP 3 and CHP 4) and the Amgalan heat only boiler which produce heat for the District Heating network. There are also a small number of private operators which purchase heat from the above two companies and operate some central substations and building level networks.

89. The heat generation in Ulaanbaatar for District Heating is keep increasing as below Figure 23.

Figure 23. Heat Generation in Ulaanbaatar



ii. Heating system assessment in Sharkhad subcenter

90. Sharkhad subcenter is roughly 6km away from the Central Business District, Sukhbaatar square and the nearest subcenter Denjiin. Located in the eastern Ulaanbaatar zone, Sharkhad subcenter includes areas of Khoroo 9, 17, 19, 22, and 24 in Bayanzurkh district. Sharkhad settlement areas are limited by the surrounding natural conditions such as Khan Khentii Mountain in the north and Ulistai river basin in the east. The steep mountainside in the north limits all ger area settlements, and the eastern river basin has marshy land, which has limited industrial units.

91. In terms of heating source for the project subcenter, Amgalan Heating plant, which is about 700 m away from the project subcenter and the plant is covering the eastern part of the Ulaanbaatar can be main source. The major features of the plant are as below:

(i) Three boilers with capacity of 116 MW each;
(ii) Computer control system;
(iii) Two heating distribution pipelines with 2Φ700 mm;
(iv) 11 kW two-circuit electricity air-transfer line 350 m;
(v) Electricity sub-station;
(vi) Fuel transmission facilities;
(vii) Railroad extension;
(viii) Network water pump; and
(ix) Pipes and electricity transmission facility equipment.

92. Connection to the existing heating network would significantly reduce the cost and complexity of providing heat to new areas, but unfortunately is not possible everywhere. In this regard, the consultant has consulted with the Ulaanbaatar district heating company to look for the way to supply the heating from the Amgalan heating plant.

93. The improvement in the atmospheric environment is expected to be significant. Due to the fact that business activity the area is one of the most polluted and high traffic congested area of the Ulaanbaatar city, the less individual heating boiler and plant is required.

94. The Figure 24 below shows area covered by the plant and its pipe network system already installed from Amgalan Heating Plant to Sharkhad Area. The Amgalan Heating Plant shown in the Figure 24 below can confirm that Sharkhad area is wider than the area heating is supplied.

Figure 24. Heating Supply Status in Sharkhad Area

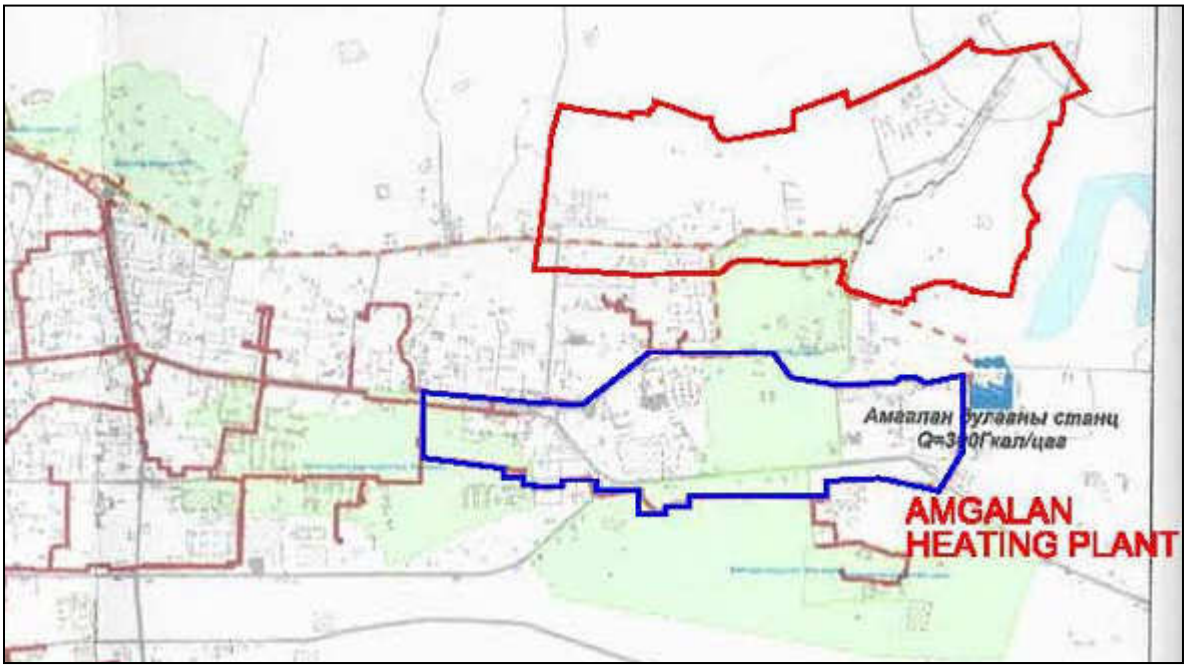


Figure 25. Heating Supply Network from Amgalan Heating Plant Shown on Google Map

Phased investment plan for heating supply in Sharkhad subcenter

95. Amgalan heating plant had considered covering heat demand about 300 Gcal/h of existing customers and to be built in the east of the HOB in the future. But it is considered Amgalan HOB operates half of design capacity due to delay of resettlement, land acquisition and construction. Also, the neighbored subcenters such as Denjiin 1,000 and Dambadarjaa is being planned to use the heating source from Amgalan heating plant.

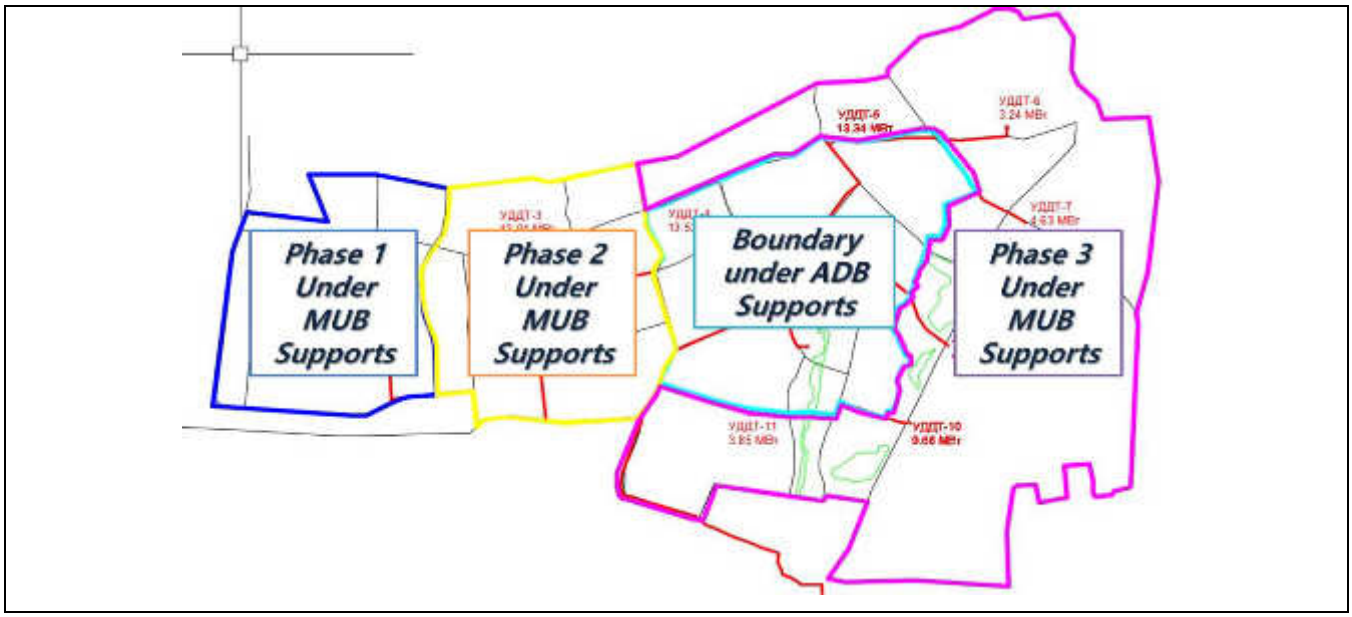
96. In addition, other than the boundary under ADB supports, which has a clear implementation schedule till year 2022, the implementation schedule and operation points are not scheduled and the development plans for the neighbored area are not clearly planned other than NOSK planned district at Western part of the subcenter (Phase 1 under MUB supports), which means the infrastructure plans including heating supply for the area other than area outside ADB support boundary is variable subject to the development and future infrastructure plans.

97. In this regard, the consultant has planned a phased implementation plan for the heating supply considering the capacity of Amgalan heating plant with engineering perspective as below Table 24, which is crucial for implementation and investment plan for the boundary under MUB supports. And the consultant has assessed the availability of heating supply from Amgalan heating plant and consulted with the PMO boundary under ADB supports could be supplied with the remaining heating capacity of the Amgalan heating plant, which is required to officially consult with the UB district heating company during design stage.

Table 25. Phased Heating Supply Infrastructure Investment Plan

Division	Area	Heating Demands	Characteristics
Boundary under ADB supports	124 ha	20.75 MW	Car markets, residential and commercial area
Phase 1 under MUB supports	79 ha	9.79 MW	NOSK planned to develop with residential area
Phase 2 under MUB supports	94 ha	14.88 MW	Commercial and Residential area
Phase 3 under MUB supports	271 ha	37.52 MW	Mostly green space

Figure 26. Phased Heating Supply Infrastructure Investment Plan



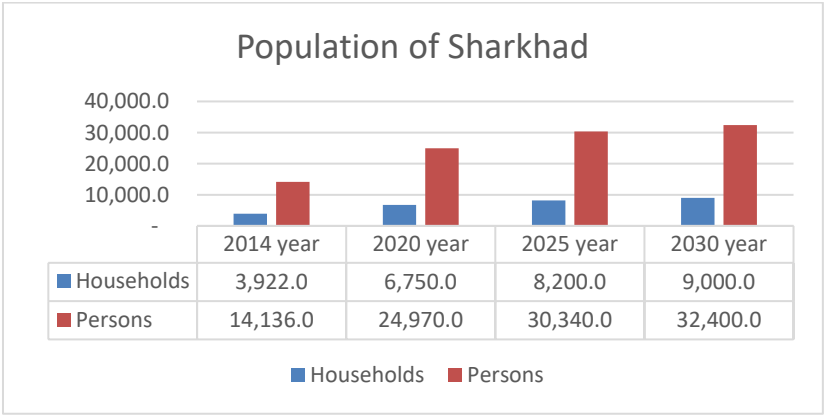
98. However, for the area other than ADB support boundary, the consultant reckons the phased plan considered with the investment efficiency is required and the phased plan shall reduce the construction cost, air pollution and synchronize the development progress of the subcenter with entire UB development.

99. Considering above, the detailed design and supervision consultant engaged by MUB shall thoroughly assess the plan, study, and projects and continuously consult with the relevant authority and its clients to optimize the phased investment plan in its implementation and minimize the individual heating plant.

Population data

100. In the partial urban planning of Sharkhad area, which has been developed by Nart Design LLC and approved by Construction Development Center of Mongolia in May 24, 2016, the population has been projected as follows (Refer to Figure 27).

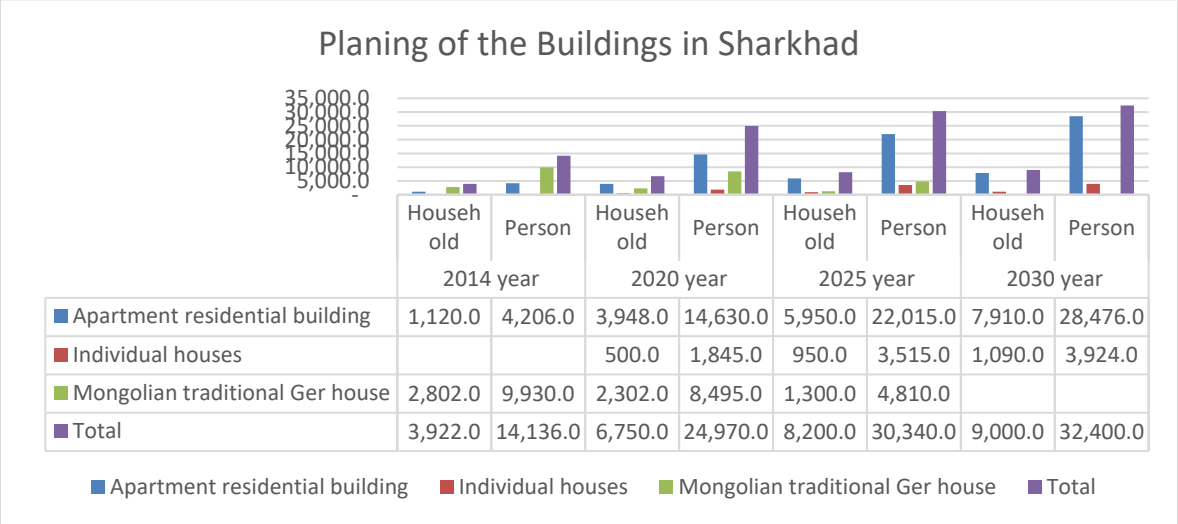
Figure 27. Planning of Sharkhad the Population



Building construction

101. Construction of residential apartment and houses of Sharkhad area is planned as given the chart below (Refer to Figure 28).

Figure 28. Planning of the Buildings in Sharkhad



	Household	Person	Household	Person	Household	Person	Household	Person
	2014 year		2020 year		2025 year		2030 year	
Apartment residential building	1,120.0	4,206.0	3,948.0	14,630.0	5,950.0	22,015.0	7,910.0	28,476.0
Individual houses			500.0	1,845.0	950.0	3,515.0	1,090.0	3,924.0
Mongolian traditional Ger house	2,802.0	9,930.0	2,302.0	8,495.0	1,300.0	4,810.0		
Total	3,922.0	14,136.0	6,750.0	24,970.0	8,200.0	30,340.0	9,000.0	32,400.0

Heating demand estimation and facility plan

102. As the estimation of heating demands (more details elaborated in Section 7), the estimated total heat demand is 20.75 MW for ADB support boundary and 62.18 MW for MUB support boundary and the main heating source is from Amgalan Heating plant and 12 heating distribution stations projected for heating supply.

103. Heating supply for Tranche 3 subcenters will be covered by the central heating network of UB city, which was confirmed by the UBDN on 31 August 2019.

iii. Tolgoit subcenter

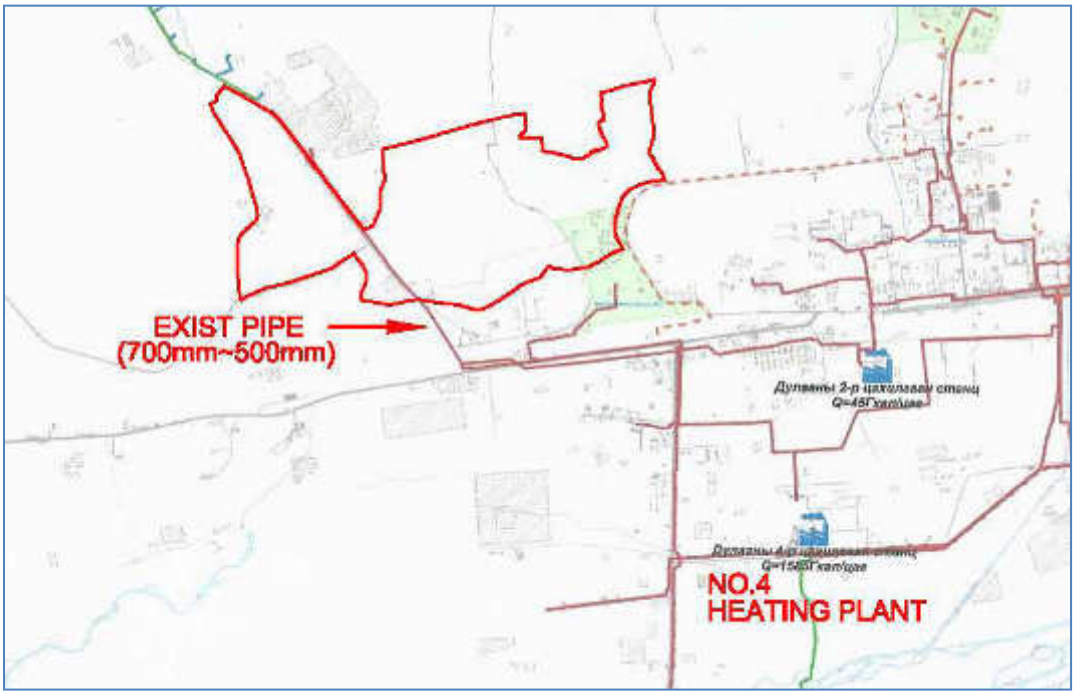
Current condition assessment

104. Tolgoit subcenter is roughly 12 km away from the Sukhbaatar square and 4 km away from the nearest Bayankhoshuu subcenter. The site is at the periphery of the far western urban development. Tolgoit topography varies from EL +1263 to EL + 1361 from south to north following the mountain hills.

105. The state-owned No.4 Heating Plant in Ulaanbaatar is 600 m away from the Togoit subcenter and the plant is the biggest power station in Mongolia. It consists of 3x100 MW steam turbine generator units (#2, 3, and 4) and 3x80 MW steam turbine generator units (#1,5, and 6). The steam turbine generator units are connected to eight boilers through a common main steam header. The current combined maximum continuous rating of all the eight steam turbine generator units is 540 MW.

106. In the Tolgoit area, 500 mm ~ 700 mm heating pipe network was already constructed from No.4 Heating Plant and spanning through to the northern part of the subcenter. The Figure 29 below shows the pipe network system already installed from No.4 Heating Plant to Tolgoit Area.

Figure 29. Tolgoit Area Heating Network Status



Population

107. According to Ulaanbaatar city statistical information, the area of the khoroo 1 and 2 of Songinokhairkhan district has been done in 2013. Therefore, for the population growth rate calculation has been analyzed the statistical data between 2013 and 2018. The khoroo number 1 population has been significantly dropped between 2017–2018. There isn't a reasonable explanation for this situation, we proposed it is data input mistake and decided to use the data from 2013 to 2017.

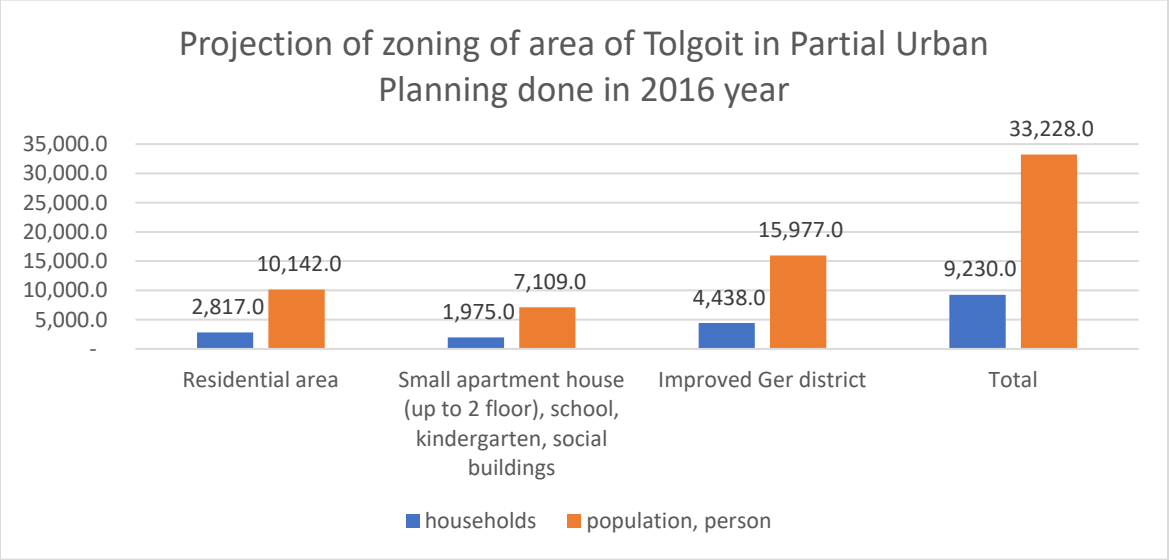
Table 26. 1 and 2 khoroo population between 2013–2018

Year	Khoroo		Total
	1	2	
2013	13,063	12,199	**25,262**
2014	14,481	12,617	**27,098**
2015	14,745	14,569	**29,314**
2016	14,569	14,037	**28,606**
2017	15,159	13,589	**28,748**
2018	14,179	14,491	**28,670**

Building Area Zoning

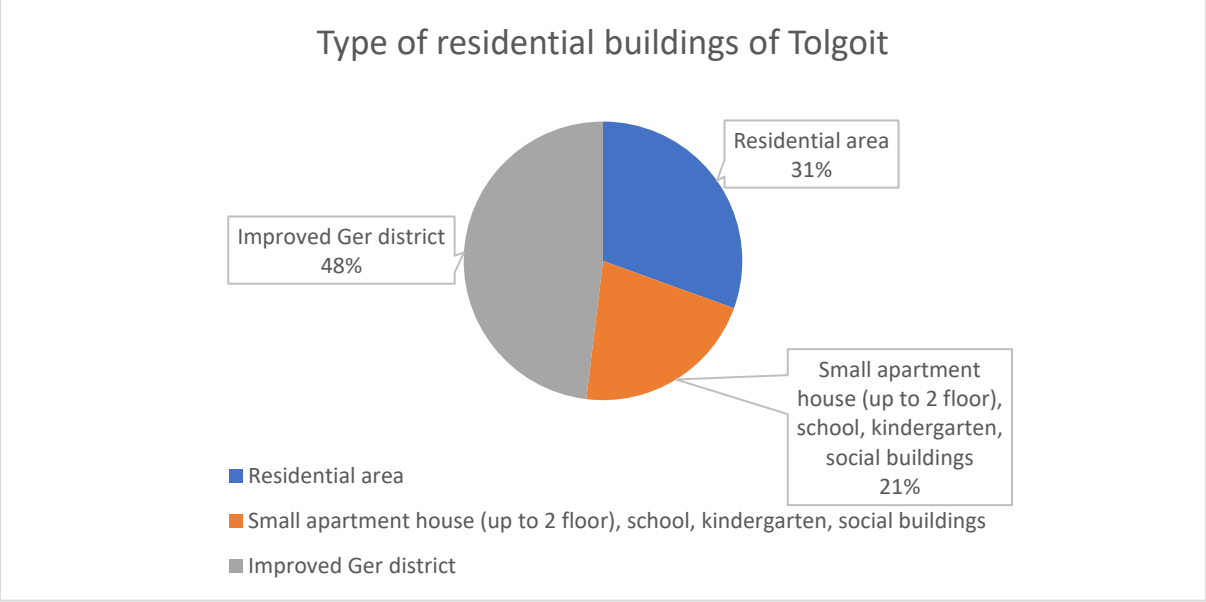
108. Figure 30 shows building area zoning.

Figure 30. Projection of Zoning for Tolgoit



109. The percentage of type of residential buildings shown in below Figure 30.

Figure 31. Residential Buildings of Tolgoit



Heating demand estimation and facility plan

110. The heating demands for the Tolgoit subcenter is estimated at 76.86 MW which is divided into 19.73 MW for boundary under ADB supports and 57.13 MW for the boundary under MUB supports. No.4 Heating Plant has sufficient heating capacity to supply heating to the Tolgoit subcenter, the size and capacity of heating plant can be reduced. Ulaanbaatar Development Master Plan 2030 has projected general projection for this area.

111. Heating supply for Tranche 3 subcenters will be covered by the central heating network of UB city, which was confirmed by the UBDN on 31 August 2019. Connection to the existing heating network would significantly reduce the cost and complexity of providing heat to new areas.

Phased investment plan for heating supply in Tolgoit subcenter

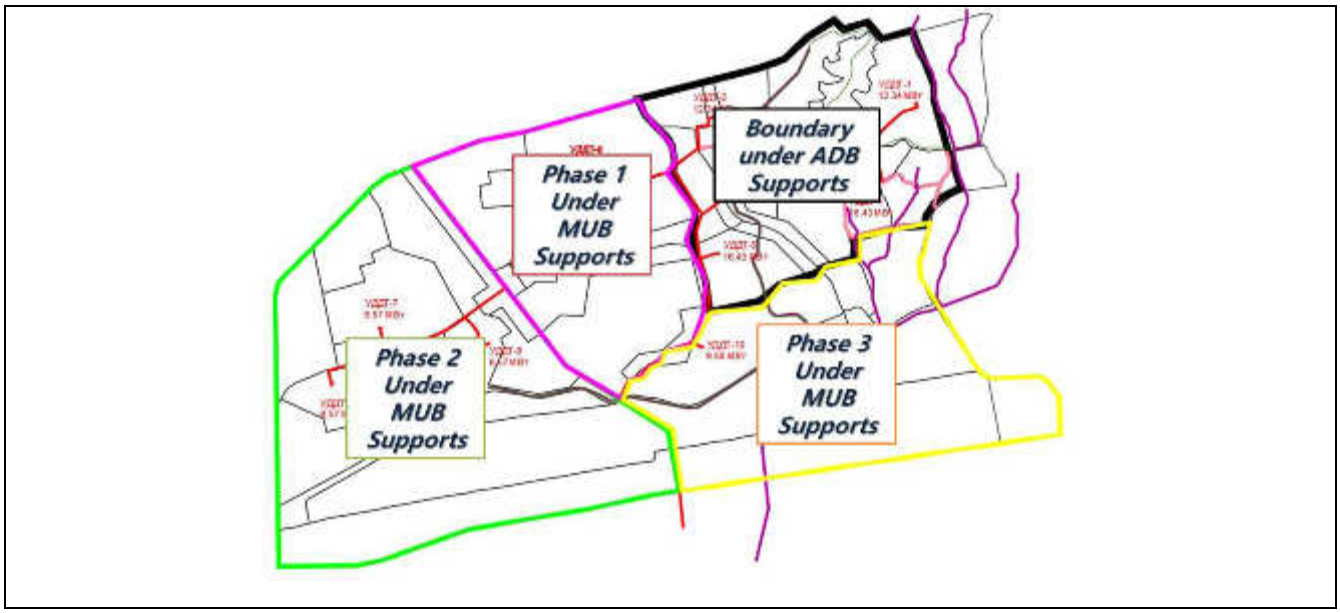
112. Other than the boundary under ADB supports, which has a clear implementation schedule till 2022 year, the implementation schedule and operation points are not scheduled and the development plans for the neighbored area are not clearly planned, which means the infrastructure plans including heating supply for the area other than area outside ADB support boundary is variable subject to the development and future infrastructure plans.

113. In this regard, the consultant has planned a phased investment plan for the heating supply as below, which consists of the largest part of the cost estimation. And the consultant has assessed the availability of heating supply from No. 4 heating plant and consulted with the PMO boundary under ADB supports could be supplied with the remaining heating capacity of the No. 4 heating plant, which shall be officially consulted by the UB district heating company.

Table 27. Phased Heating Supply Infrastructure Investment Plan

Division	Area	Heating Demands	Characteristics	Remarks
Boundary under ADB supports	153.4 ha	19.73 MW	Green Space with waterway and residential / commercial area	
Phase 1 under MUB supports	141 ha	19.74 MW	Extendable from ADB boundary, commercial and residential area and easily accessible from main arteries	
Phase 2 under MUB supports	273 ha	19.62MW	Residential and commercial area with vacant space owned by Military	
Phase 3 under MUB supports	172 ha	17.77 MW	Mostly industrial space	

Figure 32. Phased Heating Supply Infrastructure Investment Plan



114. For the area other than ADB support boundary, the consultant reckons the phased plan considered with the investment efficiency is required and the phased plan shall reduce the construction cost, air pollution and synchronize the development progress of the subcenter with entire Ulaanbaatar development.

115. Considering above, the detailed design and supervision consultant engaged for each of MUB supports boundary shall thoroughly assess the plan, study, and projects and continuously consult with the relevant authority and its clients to optimize the phased investment plan in its implementation and minimize the individual heating plant.

5. Existing power supply network

i. Sharkhad subcenter

116. Sharkhad subcenter has connected to central electrical system and supplied from Ulaankhuaran electrical substation which is located outside of the boundary. The Ulaanhuaran electrical substation was built in 1991. During the site visit to the substation and meeting with the engineers from the operational entity (Ulaanbaatar Power Distribution Network SOE), it was noted that noise level was at normal level (35.8 dB), there is no toxic waste generated and the substation is surrounded with proper fencing for safety reasons (Figure 33 below). The substation has been operating in a technically good condition. The only need is being expansion of its capacity in order to meet growing demand. Current capacity of the substation is 20 MW. (Table 28) and it will be expanded to 50 mVA power capacity within the Project. Location of substation and existing electricity transmission lines in the boundary are shown in Figure 33.

Figure 33. Existing Electricity Supply Condition of Sharkhad Subcenter

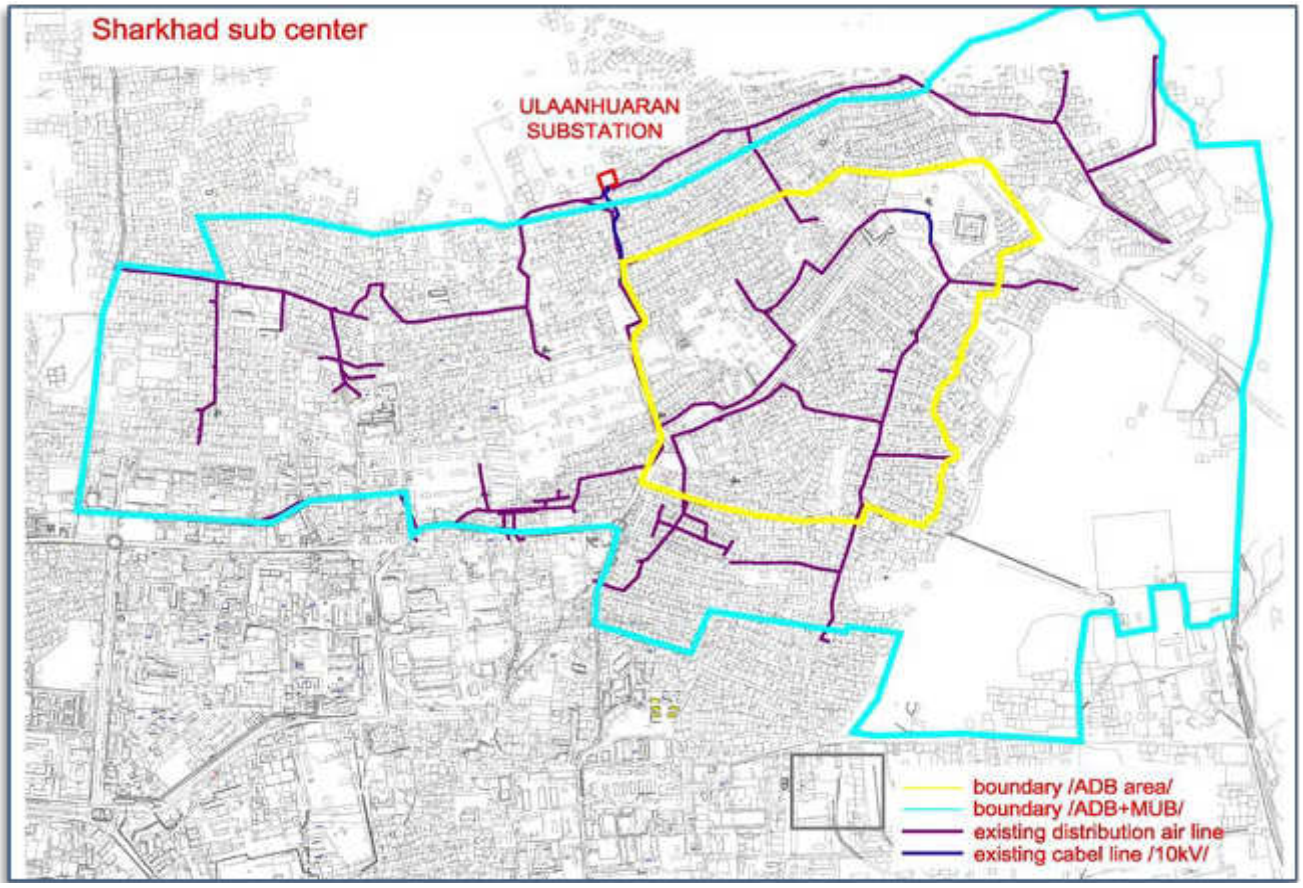


Figure 34. Current View of the Ulaanhuaran Electrical Substation

Table 28. List of Substations with Total 110 KW power

№	Substation name	Transformer type	Quantity	Capacity/ MW/	Total capacity/ MW/	Year of built	Operated years
1.	Ulaankhuaran	TDTN-10000/110/10	2	10	20	1991	28
	Total			**10**	**20**		

ii. Tolgoit subcenter

117. "Tolgoit" substation is located in western part of Ulaanbaatar city and has connected to central electricity supply system via "Tseverlekh" substation which is located outside of our boundary. Also, some parts of subcenter are connected to substations of "Geo" and "RP-110." Total capacity of "Geo" and "Tseverlekh" substations are 100 MW (Refer to Table 29).

118. Existing substation and most of the distribution air and cable lines have already been used for more than decades and need to be properly maintained. 110 KW power of electricity transmission air-line from third thermal power plant to Bornuur sub province as well as "PRP-110" to "Geo" substations transit through south western and southern part of the construction area of the subcenter respectively, therefore, protection zone of these lines shall be considered during the detail design.

119. Substation and electricity transmission lines of the Tolgoit subcenter are shown in Figure 35.

Figure 35. Existing Condition of Tolgoit Subcenter Electricity Supply System

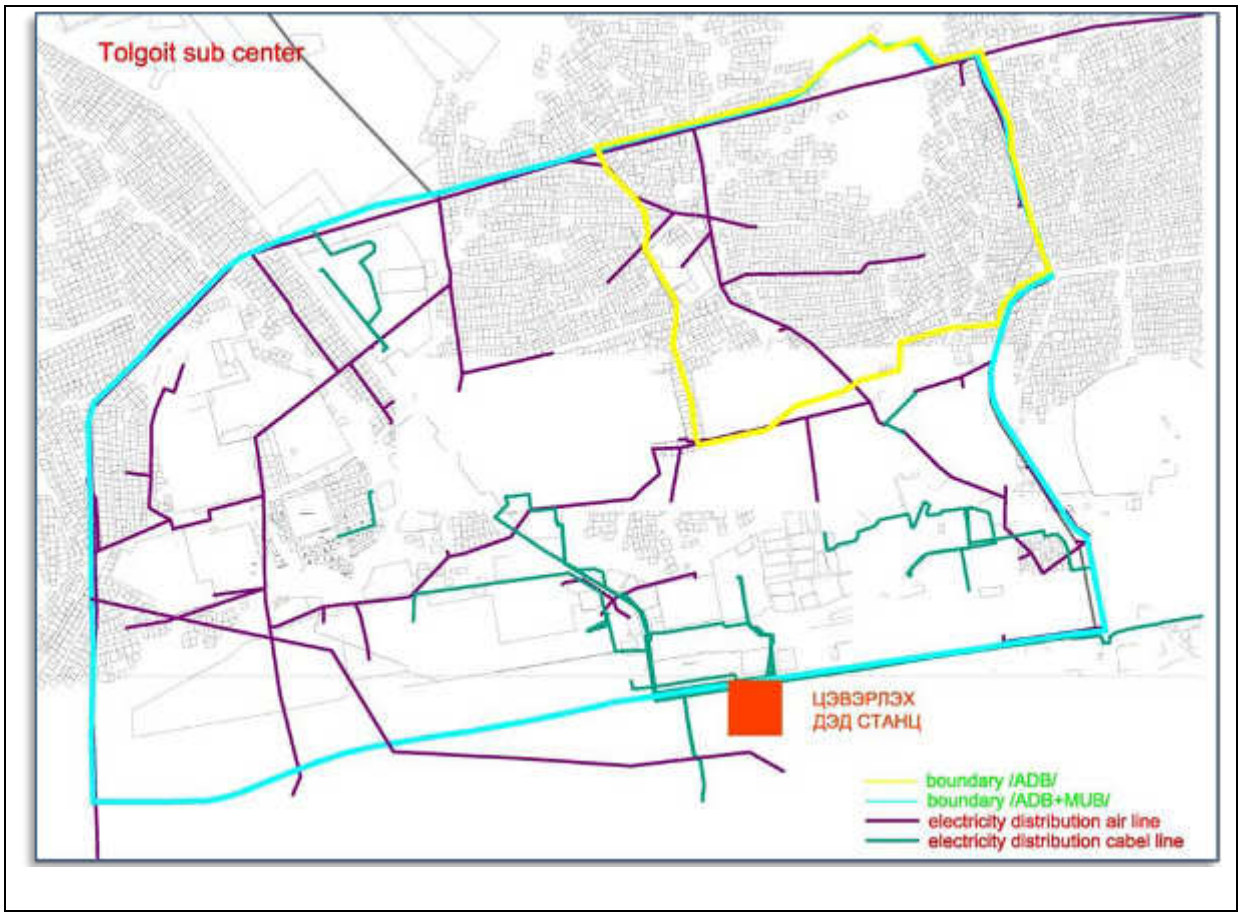


Table 29. List of Substations with Total 110 KW power

№	Substation name	Transformer type	Quantity	Capacity/ MW/	Total capacity/ MW/	Year of built	Operated years
1.	Geo	TDTN-25000/110/10/10	2	25	50	1988	31
2.	Tseverlekh	TDTN-25000/110/35/10	2	25	50	1993	26
3.	RP-110						
	Total			**50**	**100**		

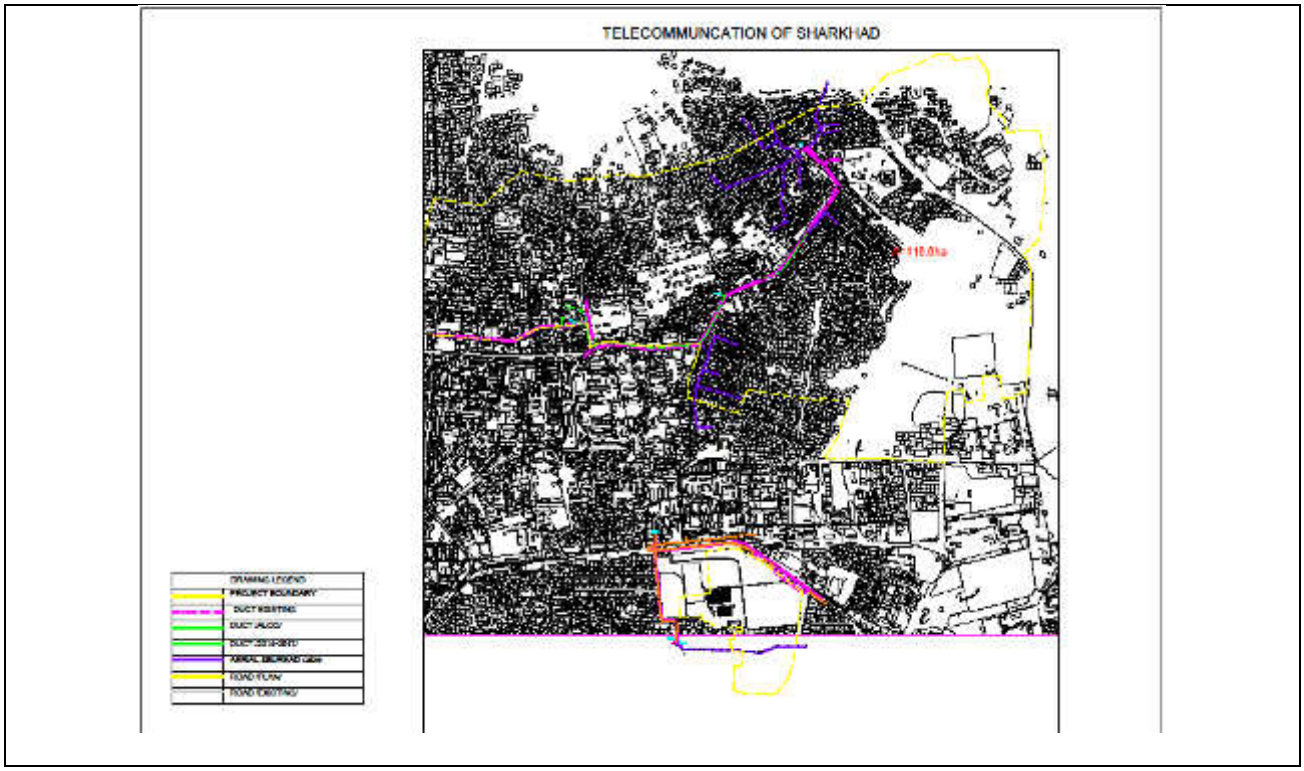
6. Existing telecommunication network

i. Sharkhad subcenter

120. Currently used service of telecommunication network, which is included in the partial master plan, belongs to Communications and Information Technology Authority ATC-45 station.

121. The ATC-45 station has a total of 65 cross connection cabinets and provides west side of the city with telecommunication services. From these 4501, 4503, 4506, and 4505 cabinets Sharkhad area is provided with telecommunication services under partial master plan.

Figure 36. ATC-45 Station Planning Section's Underground Cistern and Air Cable Pipeline Channel Blueprint



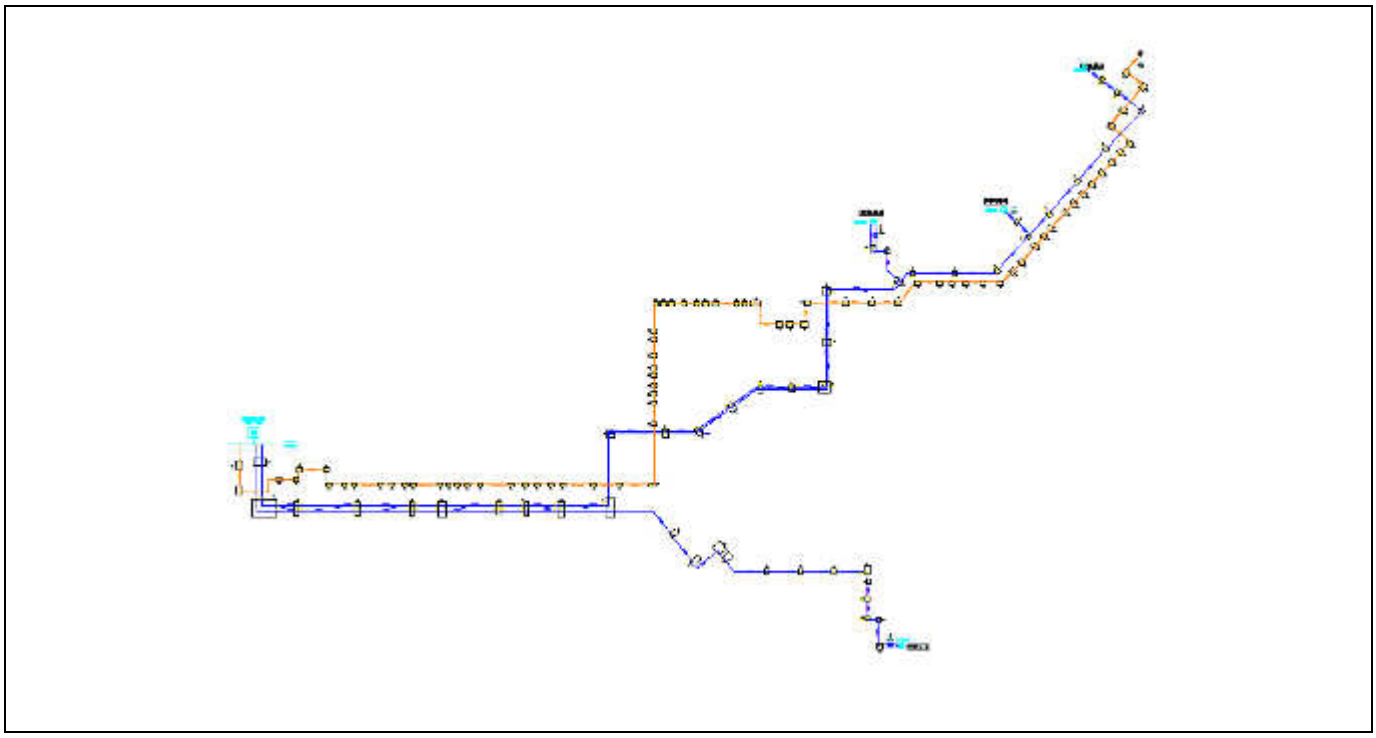
122. The 4501, 4503, 4506, and 4505 cross connection cabinets are connected to the west side of ATC -45 station, through the main road with (four) pipe channel connection. The above have two types. These include:

(i) The old channel was installed from 1980 to 1989 as a concrete pipe, with the channel depth of 0.5-0.6 m; and
(ii) 110 mm PVC pipes were installed between 1992 and 1996 within the MON-1,300 project. It's difficult to operate because the space between channels are 300 m.

123. Most of branch cables are connected to private houses, that is why most of them are connected through air cable. [15] The following figure shows the blueprint of the cross-connection cabinet's main sharing cables.

[15] The Mongolian National Telecommunication Company has authority to connect and the company has its operational procedure which will be followed for labor's safety. The scope of the project is only installing the main lines.

Figure 37. ATC-45 Station Planning Section's Blueprint of Sharing Cabinet Main Sharing Cables



124. Because of the MON-1300 project which was implemented between 1992 and 1996, manhole, cable extensions, upgraded manhole facilities, increasing consumer demands requiring technology upgrades; private operator companies have brought large number fiber optic cables. As a result, duplication of networks has become common issue. Manhole capacity is already full having no space for future resource and doesn't have safety condition.

125. For telecommunication industry, demand for landline telephone users has been reduced due to lack of technological innovation and investment in recent years.

Supply assessment:

126. There are 8,990 households and 32,410 residents according to the planned population estimates. These are all available for possible demand of landline telephone and internet service usage.

127. The Sharkhad center is densely populated. The ACT-45 station is connected to central network of ACT-32 station with fiber optic cable.

128. There are 600 couples branch cables from the station that are located within the planning area and connected to the end-user's device with air-cable.

129. Access to primary duct is poor. Although manhole of primary duct that is based on main cable along with road is available till secondary duct, it doesn't have secondary duct manhole.

130. In the future planning stage, the primary duct and secondary duct need to be re-planned reflecting needs of planned population and the building location.

131. The above planning must be whole tunnel system of engineering networks. This will enable establishment of telecommunication network, land use and monitoring system to provide customers with telecommunication service access.

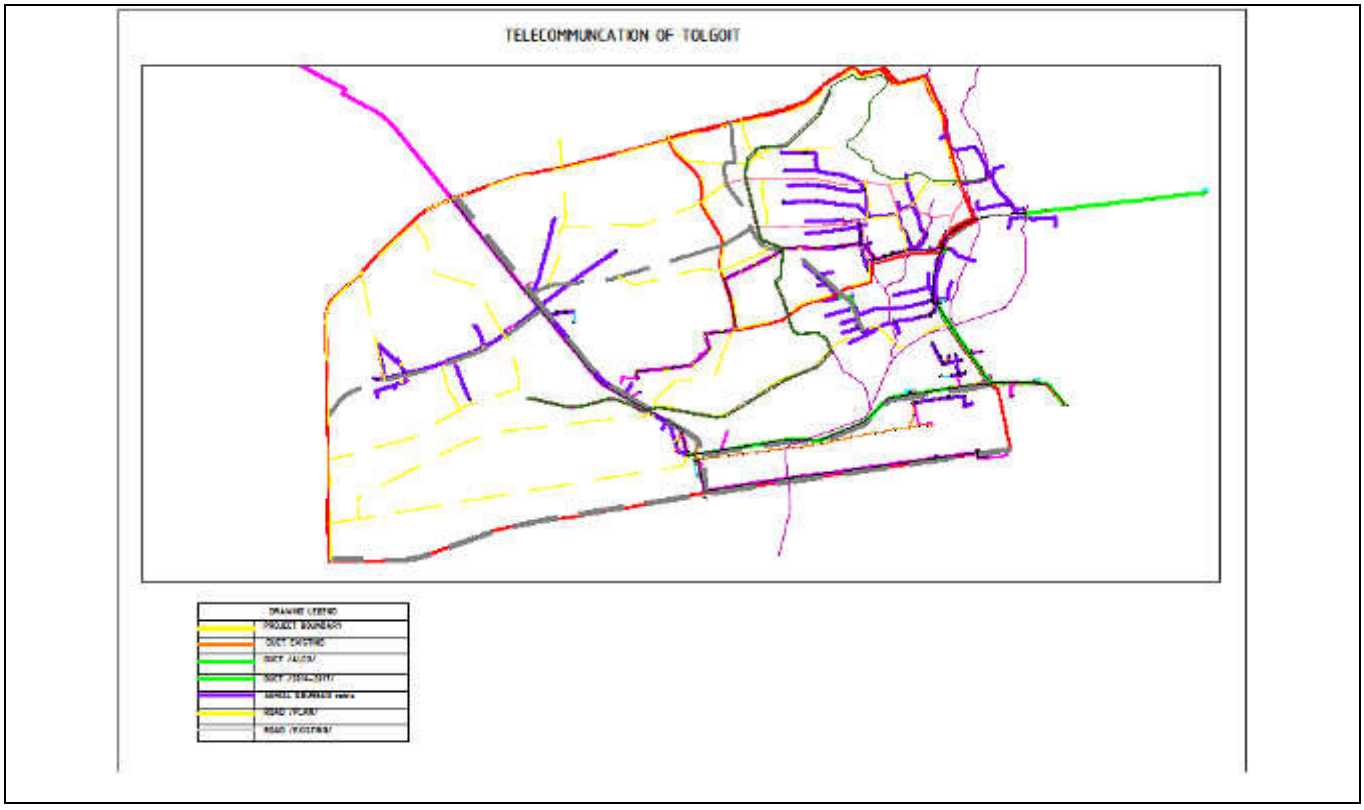
iii. Tolgoit subcenter

Current condition assessment

132. Currently used service of telecommunication network, which is included in the partial master plan, belongs to the Communications and Information Technology Authority -63 station.

133. The ATC-63 station has a total of 21 cross connection cabinets and provides telecommunication service to west part of the city. From these 6301, 6302, and 6303 cabinets, Tolgoit telecommunication is provided under the partial master plan.

Figure 38. ATC-63 Station Planning Section's Underground Cistern and Air Cable Pipeline Channel Blueprint



134. The 6301, 6302, and 6303 cross connection cabinets are connected to the west side of the ATC -63 station, along with the main road with (four) pipe channel connections. The above have two types. These include:

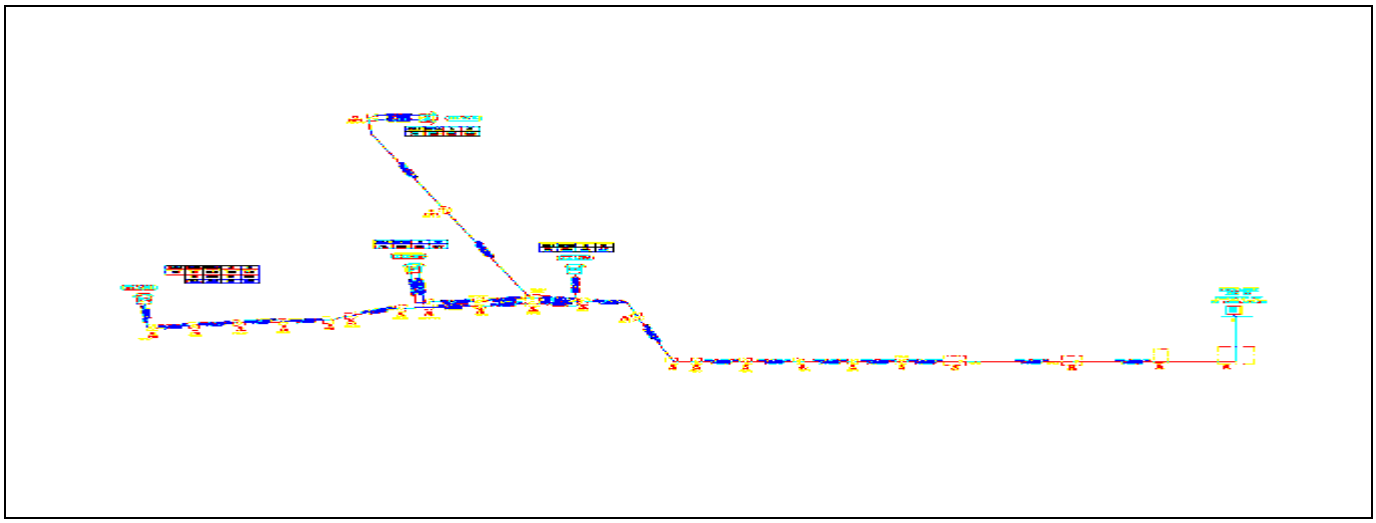
(i) The old channel was installed from 1980 to1989 as a concrete pipe, with the channel depth of 0.5–0.6 m; and

(ii) 110 mm PVC pipes were installed between 1992 and 1996 within the MON-1,300 project. It's difficult to operate because the space between channels are 300 m.

135. In this section, the new extension is in progress. In 2014, 4500 meters of cistern with 110 mm four PVC pipes, in 2016, 2100 meters of cistern with 110 mm four PVC pipes, In 2015, 1,800 meters of cistern with 110 mm four PVC pipes were installed.

136. Most of the branch cables are connected to private houses, that is why most of them are connected through air cable. The following figure shows the blueprint of the sharing cabinet's main sharing cables.

Figure 39. ATC-63 Station Planning Section's Blueprint of Sharing Cabinet Main Sharing Cables



137. Because of the MON-1300 project which was implemented between 1992 and 1996, manhole, cable extensions, upgraded manhole facilities, increasing consumer demands requiring technology upgrades; private operator companies have brought large number fiber optic cables. As a result, duplication of networks has become common issue. Manhole capacity is already full having no space for future resource and doesn't have safety condition.

138. For telecommunication industry, demand for landline telephone users has been reduced due to lack of technological innovation and investment in recent years.

Supply assessment:

139. There are 3,164 households and 11,685 residents according to the planned population projection. These are all available for possible demand of landline telephone and internet service usage.

140. The Tolgoit subcenter is densely populated. The ACT-63 station is connected to the central network of the ACT-32 station with fiber optic cable.

141. There are 600 couple branch cables from planned substations and cross cabinet connection. Within ger urban area these are connected to the end-user's device with air-cable.

142. Access to primary duct is poor. Although manhole of primary duct that is based on main cable along with road is available till secondary duct, it doesn't have secondary duct manhole.

143. In the future planning stage, the primary duct and secondary duct need to be re-planned reflecting needs of planned population and the building location.

144. The above planning must be whole tunnel system of engineering networks. This will enable establishment of telecommunication network, land use and monitoring system to provide customers with telecommunication service access.

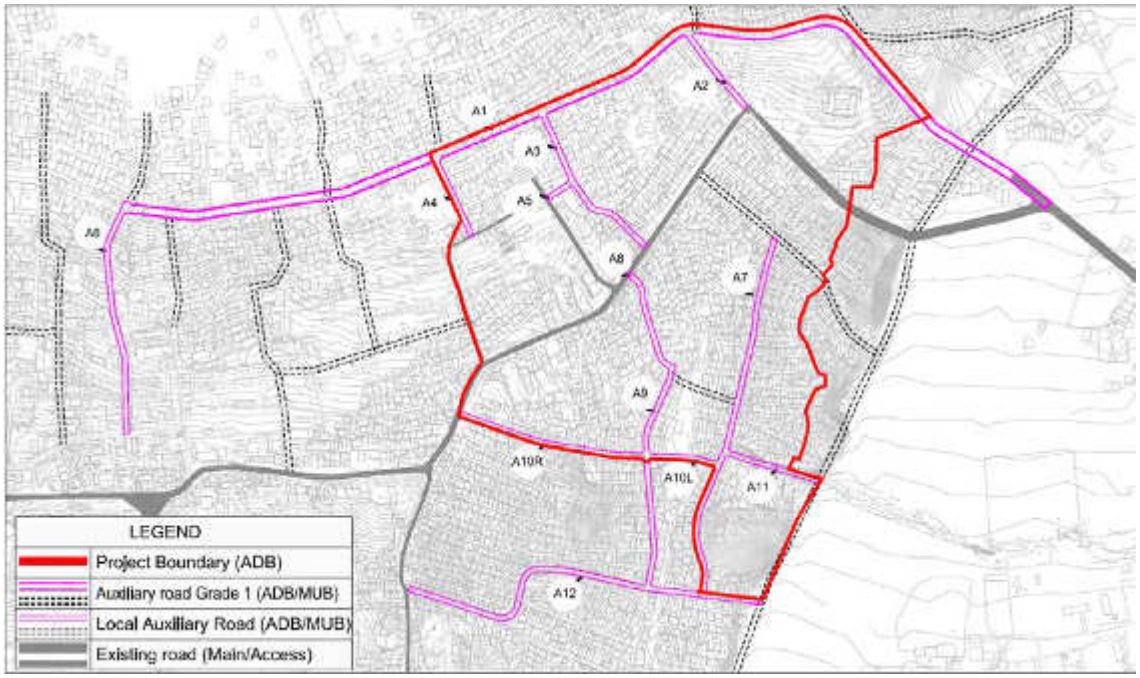
C. Proposed infrastructure development for Sharkhad subcenter

1. Road and urban services development for Sharkhad subcentre

i. Overview

145. The project road plans must accommodate the existing situation and future plans to extent possible, so, the consultant has designed considering traffic circulation for the road network surrounding the development plan which has mentioned in Section 3, road network planning. In this regard, the consultant has prioritized the internal and external roads connecting to the center of the city that has the potential to develop the economy of Ulaanbaatar and accessible to the core area as well as the traffic variance.

Figure 40. Proposed Road Alignment of Sharkhad (Project Area)



146. The consultant figured out that current road structure is quite dependent on the geographical conditions, such as steep slope landscape; thus, road formation cannot reach the network system. Hence, the roadway alignment has been developed based on the concept 1) Maximum use of the existing road

for minimum resettlement, 2) Implementation of priority road from local needs in order to enhance the accessibility, 3) Compliance with the Master Plan in addition to enhancing the site accessibility.

147. This approach should correspond to the current UBMP 2030 and distribute the concentrated traffic from the main road by improving nearby roads and the below classification has been developed based on the connection with existing roadway and main access plan on the UBMP 2030.

Table 30. Road Components of Sharkhad (Project Area)

Div.		Main road Grade 2 (W = 24.7 m)		Local road (W = 14.7 m)		Total
		Using Exist road network	Using Ger area	Using Exist road network	Using Ger area	
Project Area	Road	-	2.92 km	-	5.96 km	8.87 km
	Bridge	-	-	-	-	-

148. In design perspective, it is crucial that road design has to be based on the Mongolian standards, which has been developed from many years of experience and accumulated data. From this section, the direction and basic criteria utilized for the concept design is elaborated with applied Mongolian road design standards.

ii. Geometric criteria

149. Design standards of the road are fixed as per the discussion with the Client (PMO) and the information provided to the consultant shows the design standards to be adopted in the project (refer below table 31). The Consultant went through every standard in detail and has suggested the most suitable criteria to be adopted for the proposed Subcenter. Most of the existing standards are found suitable other than Maximum Gradient.

150. According to the MN road design standard, urban area Maximum Gradient is 8%. However, most of the section of the alignment in the subcenter falls in the hilly region and the consultant found that it is very difficult to achieve the gradients for urban area as stated in the existing standard. In addition, the gradients for subcenter area is practically applied around 10~14% due to the existing roadway and residences in the region. Therefore, the consultant suggested adopting a Maximum Gradient of 12% for the Ger area.

Table 31. Design Standard of Subcenter Road

S.N	Design Parameter	Auxiliary road Grade 2		Local Collector Road	
		Existing MN Standards	Applicable	Existing MN Standards	Applicable
1	Design Speed	50 km/h	50 km/h	30 km/h	30 km/h
2	Right-of-Way	33	33	24.5	26
3	Carriageway Width	3.5 m	3.5 m	3.0 m	3.5 m
4	Total Formation Width	23	24.7	14.5	14.7

S.N	Design Parameter	Auxiliary road Grade 2		Local Collector Road	
		Existing MN Standards	Applicable	Existing MN Standards	Applicable
5	Shoulder Width (L guard+0.5 earth shoulder)	1.0	1.0	1.0	1.0
6	Camber of Carriageway	2.0%	2.0%	2.0%	2.0%
7	Camber of Shoulder	4.0%	4.0%	4.0%	4.0%
8	Minimum Horizontal Curve Radius	79	100	30	30
9	Min vertical Sag Curve	100	1700	400	180
9-1	Min vertical Crest Curve	125	1300	500	311
10	Maximum Gradient	12	12	12(15)	12
11	Minimum Gradient	0.3	0.3	0.3	0.3
12	Vertical Clearance	4.5	4.5	4.5	4.5
13	Minimum stopping sight distance	65	65	35	35
14	Maximum super-elevation	6	6	6	6

151. All social buildings (kindergarten, school, sports complex, primary health center and business incubators) constructed within the project will be provided parking areas. Detailed plan for parking areas will be developed during the design stage.

iii. Road alignment

Horizontal Alignment

152. The horizontal alignment will be based on a design speed of 30 km/h. Curve radii of 30 m or greater are achievable.

Super-elevation

153. Super-elevation will be increased on horizontal curves on steep down-grades, as recommended in the Mongolian Geometric Design Manual. However, it is necessary to consider the application of the maximum 4% considering freezing of carriageway in the winter season as proposed by AASHTO's “Urban Arterial Road”. On curves where the radius exceeds 400m (in case of design speed 30km/h) or 1,200 m (in case of design speed 50 km/h), standard grade 2% will be used.

Vertical alignment

154. In Ger area route will have a maximum gradient of 12%. The ring road to the mental hospital will be posted at 50 km/h and will have a maximum gradient of 8%.

155. The crest curves will be designed for a speed of 30 km/h, which equates to a K value of 102. At Sharkhad ring road, the proposed K value will be 62, which equates to a design speed of about 50 km/h.
156. The adoption of a Mongolian sight-distance model provides relaxation of the current standards used above, such that the K value proposed for the crest curve is now appropriate for a design speed of 30 km/h.

157. Sag curves at intersections will have a minimum K value of 40, which significantly exceeds the normal comfort requirement for a 30 km/h design speed. Elsewhere on the main route, which will not be illuminated, a K value of 150 will be used for sag vertical curves, in accordance with the Mongolian Geometric Design Manual.

Vertical clearances

158. A 4.5 m vertical clearance will be provided to the undersides of all structures. Connections under the route for landowner access will have a nominal 3.5 m vertical clearance.

159. Base on the assessment of the Consultant, locations of bridges along the road were identified. Lengths of the bridges were tentatively fixed considering the nature of stream and banks type. A list of bridges required along the proposed alignment was prepared.

iv. Bridge design types used in Mongolia

160. Bridges have been constructed by Russian / Chinese Contractors in Mongolia since the 1960s in accordance with Russian Standard. Since the 1990's Mongolian contractors apply the Mongolian Standard which is based on the Russian Standard. After the 1990's Trunk Roads projects in Mongolia funded by the Asian Development Bank, the Kuwait Fund and Japanese Grant Aid apply various Design Standards such as American and Japan standards, etc.

161. New bridges on recent ODA projects were reinforced concrete and pressed concrete types. Major bridge projects in Mongolia are shown in the below Table 32.

Table 32. List of Bridges Project in Mongolia

Location	Type	Constructed
Gurvaljin Bridge in Ulaanbaatar	RC T-beam girder	1989
Dambadarjaa Bridge in Ulaanbaatar	RC T-beam girder	1990
Ikh Tenger Bridge in Ulaanbaatar	RC T-beam girder	1994
Dambadarjaa Bridge in Ulaanbaatar	RC T-beam girder	1995
Dood Selbe bridge on Teeverchid	RC T-beam girder	2003

162. As mentioned above, most of bridges in Ulaanbaatar City are Reinforced Concrete Bridges. And the most widely used superstructure, substructure and foundation types in Mongolia are shown in below Table 33.

Table 33. Bridge Design Types Used in Mongolia

Superstructure	Substructure	Foundations
Beam and deck slab Steel truss Steel plate girder Pre-stressed beam	Massive PSC or masonry abutments and piers RCC abutments and piers	Open foundation Well foundation Pile foundation

163. The choices of superstructure, substructure and foundation type were considered for each site taking into consideration geological site conditions, method of construction, availability of construction materials and manpower, construction costs of bridge, approach roads, etc. The following types of bridges were selected for the project roads and preliminary designs were prepared for each specific bridge.

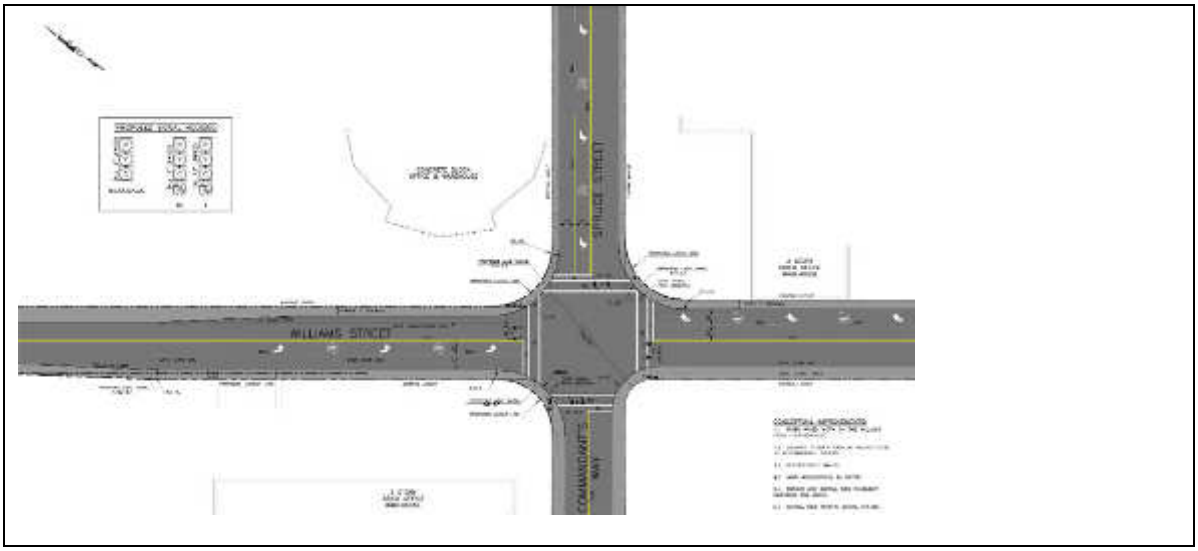
Table 34. Bridge Types in Project Area

Bridge Type	Single span length
Box bridge	Length up to 6 m
I-Beam bridge and deck slab with open foundation	Single span up to 25 m
Steel plate girder bridge with open or well foundation	Single span up 25 to 35 m
Pre-stressed T-bean bridge with well foundation	Single span more than 40 m

v. Intersection plan

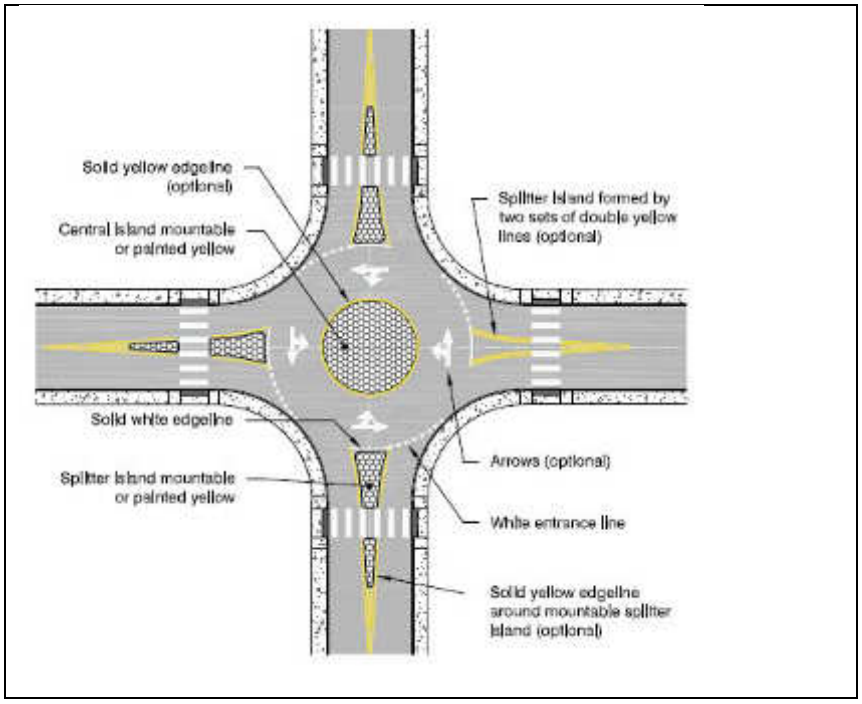
164. Location of Intersections will be reviewed in accordance with the Mongolian design standard, as detailed in “Planning for urban, street and road” (CCM 32-01-04).

Figure 41. Typical Intersection Plan in Urban Street



165. Basically, it is planned as an at-grade junction at the intersection of roads. But, in order to reduce signal waiting time and air pollution, it is necessary to consider the applicability of roundabout in the later design stage.

Figure 42. Typical Roundabout Plan in Urban Street



166. Considering the implementation of a roundabout, the at-grade components of intersections are likely to be either large roundabouts, or dumbbell roundabouts. These will all be designed in accordance with Mongolian guidelines. Key design parameters for roundabouts are:

(i) Dumbbell roundabouts have a central island diameter of 40 meters;
(ii) Sensitivity analyses are undertaken to determine optimum diameters and desirable performance;
(iii) Roundabouts will generally have two lanes, with a 10 m circulating width, but single lane operation has also been considered;
(iv) Approach and exit speeds have been considered to be lower than 30 km/h.
(v) Typical gap acceptance parameters have been used;
(vi) Ideal ramp gradients should be no more than 6%; and
(vii) Minimum lane widths on ramps and roundabouts are to be 3.5 m.

vi. Drainage plan

167. Drainage is built on the proposed roads, but rainwater cannot be completely removed. Thus, the Consultant can work with international consulting engineers to achieve infrastructure plans for roads, bridges, pipelines, drainage, heating lines, and other infrastructure and achieve international standards.

168. Good drainage is a prerequisite for a safe road in a hilly area, safe discharge of collected rainwater is another important aspect in designing a road. Usually, the capacity of a drain is calculated by using

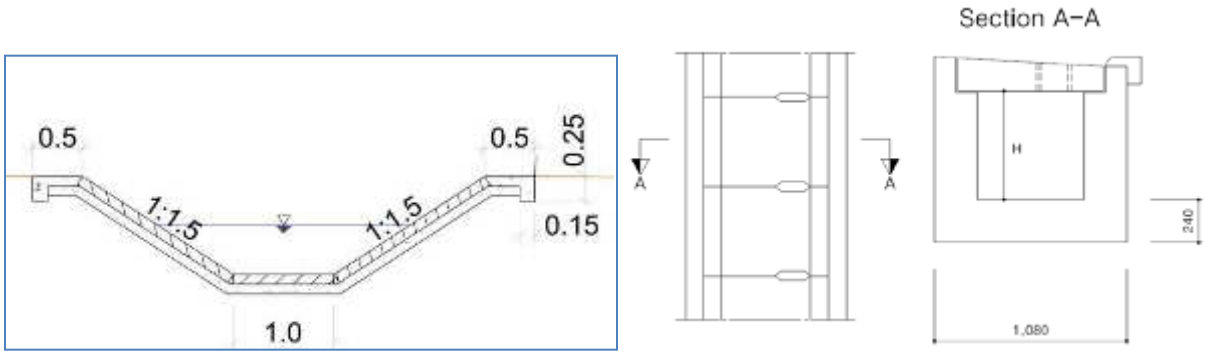
various techniques. The use of rational formula and Manning's law for velocity calculation is widely used in the road drainage design.

169. Storm water on the road surface in the Project area drained to the existing channels and rivers. At the Sharkhad subcenter, the end of the drainage system is connected to existing drainage on Da Khuree Street and Sharkhad street, which runs through the Sharhad subcenter.

Longitudinal Drains

170. Rainwater collected along with the formation of the road as well as from the hill slopes should first be channelized through the longitudinal drains constructed along the alignment of the road. The main slope of the drain should be at least 0.3%, and the slope drainage which is more than 4% should be designated as an open channel. (10.3.7 and 11.3.2 ZZBNbD 22-004-2016). There are many types of drain designs, all such typical designs are produced and given in the drawing form.

Figure 43. Open Channel and Trench Section



Cross Drainage Works

171. Cross drainage works such as culverts and pipes are required to either safe discharge of the collected water along the road or they are required to connect to the existing natural drainages such as creeks and rivulets etc. Typical designs of such structures are produced as drawings.

vii. Traffic calming

172. The speed of the motorized traffic is the parameter that is easiest to influence in securing a safe road. This involves not only the vehicle speed on approach to the intersection but also the speed passing the site. In many situations of intersection accidents in the Ger area, speed restrictions are in fact the only measure available to solve the problem.

173. Traffic calming devices designed to slow cars down on Ger area roads can provide a safe and comfortable road environment for pedestrians. In particular, among the types of devices for lowering the speed of the car on the road of Ger area formed on steep slope, the speed reduction facility which induces the deceleration of the car by using the vertical step or the change of the horizontal alignment can be effective. Such a facility can be installed with guide signs rather than being installed alone, to attract the driver's attention and increase the speed reduction effect. Traffic-calming devices can be grouped as below Table 35.

Table 35. Traffic calming devices

Categories	Description	Applied
Speed Bumps	A speed bump is a raised area in the roadway pavement surface extending transversely across the travel way, generally with a height of 3 to 6 inches and a length of 1 to 3 feet.	O
Speed humps	A speed hump is a raised area in the roadway pavement surface extending transversely across the roadway. Speed humps normally have a minimum height of 3 to 4 inches and a travel length of approximately 12 feet, although these dimensions may vary. In some cases, the speed hump may raise the roadway surface to the height of the adjacent curb for a short distance.	O
Raised crosswalks	Raised crosswalks are essentially broad, flat-topped speed humps that coincide with pedestrian crosswalks at street intersections. The crosswalks are raised above the level of the roadway to slow traffic, enhance crosswalk visibility, and make the crossing easier for pedestrians who may have difficulty stepping up and down curbs.	O
Raised intersections	Intersection humps raise the roadway at the intersection, forming a type of "plateau" across the intersection, with a ramp on each approach. The plateau is at curb level and can be enhanced through the use of distinctive surfacing such as pavement coloring, brickwork, or other pavements. In some cases, the distinction between roadway and sidewalk surfaces is blurred. If this is done, physical obstructions such as bollards or planters should be considered, restricting the area to which motor vehicles have access.	X
Mini Roundabout	These are small roundabouts, which are sometimes simply painted intersection controls. Central islands can be flat or raised. Where these are used to slow traffic before reaching other traffic calming features, the amount of deflection will determine the speed reduction gained.	Δ
Rumble Strips	Rumble strips are a series of closely spaced raised individual bars or patches that alert drivers, visually and audibly, of the need to slow down. Cyclists' needs should be considered in the design of rumble strips.	Δ
Rumble Wave	In a similar style to rumble strips, the surface pattern of rumble waves can be varied using a sinusoidal profile to generate horizontal vibration in the vehicle but very little external noise. The profile of the pattern can be varied to match the desired speed.	X
Signs	Road signs are widely used to manage and control traffic. Signs often supplement other traffic calming features, but, used alone, it is not clear how effectively they calm traffic.	O
Road narrowing	Reducing the available road space for drivers can lower traffic speeds. Narrowing the road by re-allocating space to pedestrians and/or cyclists is one way of doing this.	X

*** O : Applicable, Δ : Can be applied after the investigation of site and noise inducing factors, X : Difficult to apply due to high cost, AHs and low efficiency.**

174. Traffic calming devices can be installed in areas that require speed reduction to protect children such as schools and kindergartens, and in areas that adjacent to commercial areas with heavy traffic.

2. Water supply and sewerage plan for Sharkhad

i. Design Options and Standards

175. Each of micro subcenters shall be planned to be supplied directly through the pipes that are connected with the main water and sewerage network of Ulaanbaatar city. This will help to:

(i) Attract new private, commercial enterprises and other organizations to settle within the area. Enhance willingness to connect of private and commercial customers. Increase land value;

(ii) The main concept for the planning of water supply and sewerage pipes shall be to minimize the affected households and compensation costs. This would be also convenient for further maintenance and to install under the newly planning road or under the pedestrian walkway preferable; and

(iii) The planning of the pipe network shall be organized that can give benefits for all of residents and connect to all of public facilities such as schools, kindergartens and hospitals. The existing kiosks in the subcenters are the main water source for the residents; therefore, it will keep their operation until the newly planning water supply system begins to supply.

176. USUG is the entity responsible for operation and maintenance of water supply and sewerage facilities while UBDN (Ulaanbaatar city Heat Distribution Network SOE) is the entity responsible for operation and maintenance of heating distribution facilities. USUG and UBDN will have supervision and monitoring staffs responsible for the Sharkhad and Tolgoit areas who will inspect the technical conditions and connectivity. Since the newly constructed utility pipelines will be underground facilities and any connections works can only be executed by licensed engineering firms (license issued by Ministry of Energy for heating connection and by USUG for water and sewerage connection), there will not be any illegal connection issues. Households or entities in the project area will apply to USUG and UBDN for technical permission on connection.

177. Once the utility pipelines for water, sewerage and heating are constructed in the subcenters, households and entities in the area will apply to USUG and UBDN for technical permission on individual connection. After permission is granted, the households and entities will hire local engineering firms to make the connection at their own cost.

178. Mongolia has an extreme continental climate with higher temperature changes during the summer and winter, especially the freezing accidents occurs frequently on the existing water supply and sewerage facilities due to the extremely cold winter. Therefore, it shall be possible to take a measurement preventing from that kind of accident.

179. Installation depth of the pipes shall be defined considering the freezing depth (2.5~3.5m). Heat reserving measurement shall be prepared for the pipes. The pipes with good quality and durability shall be selected (Steel wire Reinforced Thermoplastic composite Pipe (SRTP), Steel PIPE(SP), Ductile Iron Pipe (DIP).

Water supply networks and adjuncts

180. Profiles of trenches should be according to Norms BNbD3.05.04-90; BNbD3.02.01-90; BNbD3.01.01-89; BNbD3.01.03-88; BNbD3.01.05-90 and other. The invert for individual water and sewer pipes is set at -3.0 m from soil level. Local variations can be admitted as a function of local soil topography changes. Steeper slopes up to vertical shall be accepted if special construction procedures shall be applied, including wall sustainment with jacks.

181. SRTP, which is currently recognized as high performance in Ulaanbaatar city, is supposed to be used for the distribution network, and the size of pipelines will be more than 150 mm considering the future extension. All pipe works include joints, bends, manholes, valves and fire hydrants.

182. Estimate of costs for digging and refilling of trenches has been carried out on the base of construction norms currently applied according to the above-mentioned standards and other relevant regulations and laws.

Sewerage network

183. DIP sewerage pipes with minimum 200 mm diameter shall be used. The Invert for sewer pipes is planned at -3.0m below average soil level.

184. It shall be planned keeping the appropriate distance with other utility lines since it is installed neighboring with the pipelines of water supply and heating, and a measure shall be taken at the area where it is crossed over the other pipes and facilities during the designing stage.

ii. Water demand estimation

Selection of daily consumption rate per person

185. For the estimation of water demand in targeted areas, the consultant uses the average daily consumption rate 200LCD per one person from BNBD 40-02-16.

Table 36. Daily Water Consumption Rate Per Person

Convenience level of District apartment building	BNBD 40-02-16 (L/per day)	UBMP 2030 (L/per day)	Applied
Housing with sewerage, drinking water pipeline but no bath and shower	100-150	230	200
Housing with sewerage, drinking water pipeline and bath and shower	130-180		
Housing connected with central pipeline network which has sewerage and drinking water pipeline	150-220		
Ger area supplied from water kiosk, well and spring	25-40	25	25

* Source: Water Supply Pipeline Network and Facilities (BNBD 40-02-16).

Water demand estimation

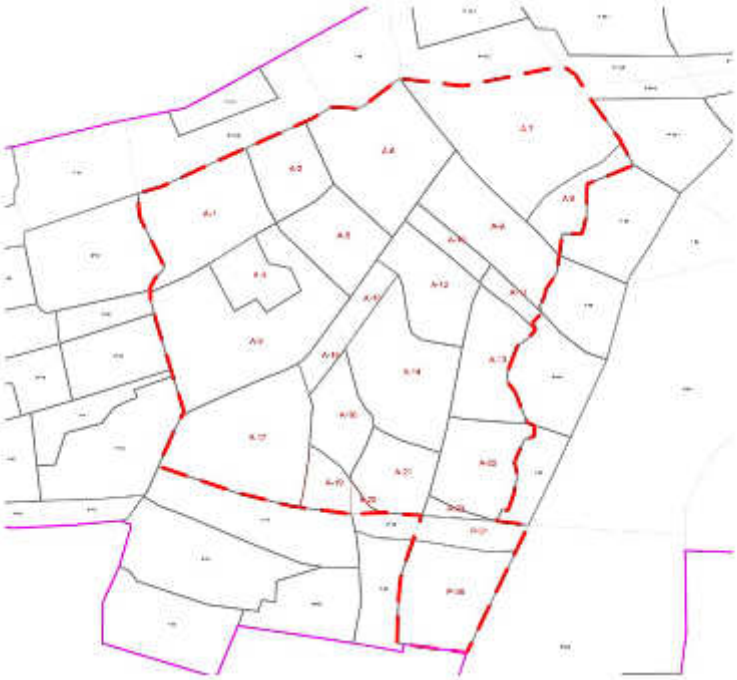
186. With population data at each block, the estimation result of water demand is as below table. In total, 99,300 planned population needs 16,000 m^3 per day of water supply and 14,700 wastewater treatment.

Table 37. Water Demand Estimation

Area		ha	Planning population	Daily average water consumption (m^3/day)	Daily Maximum water consumption (m^3/day)	Daily average wastewater generation (m^3/day)
Sharkhad	Project Area	124.0	19,742.0	3,900.0	4,700.0	4,300.0
	Subcenter Area	383.4	36,965.0	7,400.0	8,800.0	8,100.0
Tolgoit	Project Area	158.1	14,964.0	3,000.0	3,600.0	3,300.0
	Subcenter Area	603.2	22,164.0	4,400.0	5,300.0	4,900.0
Total	Project Area	282.1	34,706.0	6,900.0	8,300.0	7,600.0
	Subcenter Area	986.6	59,129.0	11,800.0	14,100.0	13,000.0

Table 38. Water Demand Estimation of Sharkhad

Block No.	Area (ha)	Density	Planned Population (p)	Planned household	daily water demand (200 l/c/d)	Daily max. (x1.2, m3/day)	Wastewater Generation (m3/day)
Project Area							
A-1	8.2	158.0	1295.6	324	259.1	310.9	285.0
A-2	3.9	158.0	616.2	154	123.2	147.9	135.6
A-3	13.4	295.0	3953	988	790.6	948.7	869.7
A-4	2.9	75.0	217.5	54	43.5	52.2	47.9
A-5	4.9	210.0	1029	257	205.8	247.0	226.4
A-6	9.6	200.0	1920	480	384.0	460.8	422.4
A-7	13.6	56.1	763	191	152.6	183.1	167.9
A-8	2.7	167.0	450.9	113	90.2	108.2	99.2
A-9	6.7	120.0	804	201	160.8	193.0	176.9
A-10	1.5	267.0	400.5	100	80.1	96.1	88.1
A-11	1.0	111.0	111	28	22.2	26.6	24.4
A-12	5.3	267.0	1415.1	354	283.0	339.6	311.3
A-13	5.4	111.0	599.4	150	119.9	143.9	131.9
A-14	8.7	180.0	1566	392	313.2	375.8	344.5
A-15	1.6	88.0	140.8	35	28.2	33.8	31.0
A-16	1.2	88.0	105.6	26	21.1	25.3	23.2
A-17	10.6	61.0	646.6	162	129.3	155.2	142.3
A-18	3.6	283.0	1018.8	255	203.8	244.5	224.1
A-19	1.8	72.0	129.6	32	25.9	31.1	28.5
A-20	0.3	72.0	21.6	5	4.3	5.2	4.8
A-21	4.0	210.0	840	210	168.0	201.6	184.8
A-22	0.5	272.0	136	34	27.2	32.6	29.9
A-23	5.6	185.7	1040	260	208.0	249.6	228.8
S/Total	**124**	**3,700**	**19,742**	**4,950**	**3,900**	**4,700**	**4,300**
Subcenter Area							
All	**383.4**	**8,700.0**	**36,965.0**	**9,953.0**	**7,400.0**	**8,800.0**	**8,100.0**
Total	**507.0**	**12,400.0**	**56,707.2**	**14,903.1**	**11,300.0**	**13,500.0**	**12,400.0**



Firefighting water

187. According to the norm BNBD 40-02-16 described in below, Subcenter Area should secure minimum 2 x 25 liters/second, 3 hours (324 m^3/day) of firefighting water.

Table 39. Firefighting Water

Urban and local area population number, 1000 person	Number of the fire occurs	In urban area water usage for outside 1 fire occur	
		2 or below floor buildings, regardless of fire resistant	3 or more floor buildings, regardless of fire resistant
Until 1	1	5	10
1-5	1	10	10
5-10	1	10	15
10-25	2	10	15
25-50	2	25	25
50-100	2	-	35
100-200	3	-	40
200-300	3	-	55
300-400	3	-	70
400-500	3	-	80
500-600	3	-	85
600-700	3	-	90
700-800	3	-	95
800-1000	3	-	100

** Source: Water Supply Pipeline Network and Facilities (BNBD 40-02-16)*

iii. Water supply plan for Sharkhad

188. In Sharkhad area, the water is currently supplied from Sharkhad Pump Station and reservoir (V = 500 m^3). But it will not be enough to supply sufficient water to all target area, expected from the further development. Thus, it is planned to supply the water with a new connection to existing water main (D600 mm, Steel pipe).

189. For stable water supply to the project area, a new pumping station with capacity of Q = 6,000 m^3/d will be constructed adjacent to the existing pumping station and a new reservoir with 2x1,000 m^3 volume will be constructed at the top of a hill nearby the subcenter within the project.

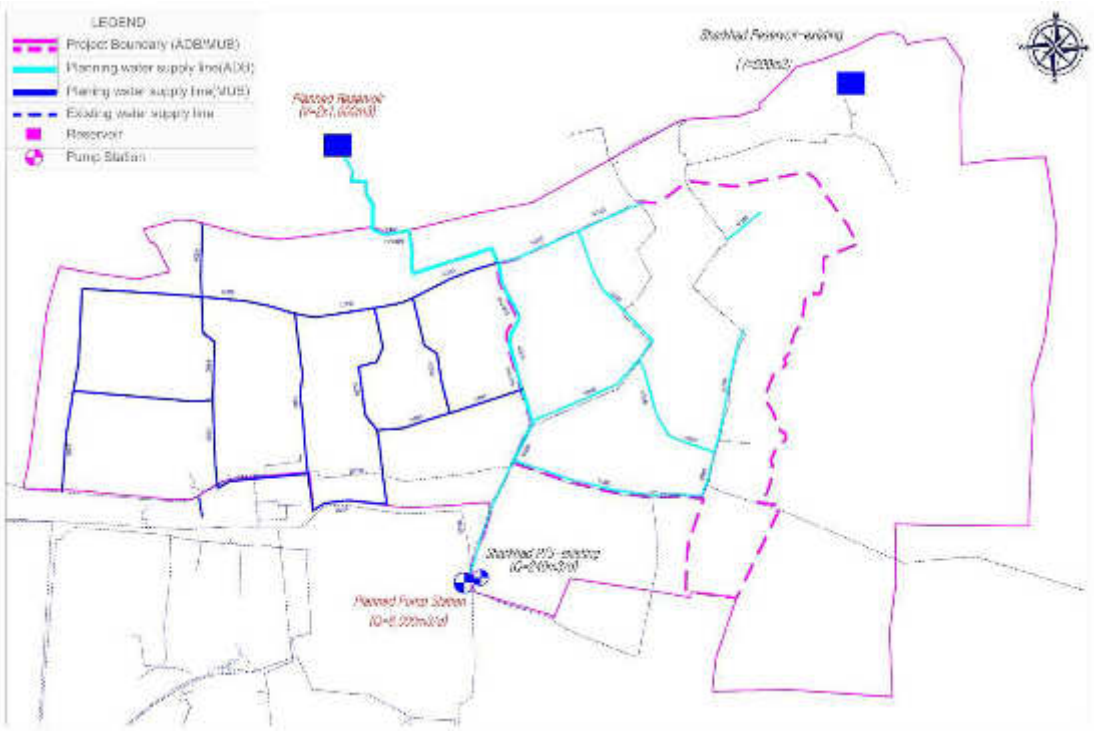
190. Total required pipe length is 7.9 km with D150~400 mm to compose water supply network of project area, and its details are shown in the below Table 40.

Table 40. Plan for Water Supply Line (Sharkhad)

No	Items	Diameter	Units	Quantity (m)	
				Project Area	Subcenter Area
1	Water supply pipeline	Φ150	m	**901.0**	330.0
		Φ200	m	**2,501.0**	4,970.0
		Φ300	m	**1,083.0**	1,845.0
		2xΦ300	m	**2,260.0**	
		Φ400	m	**1,204.0**	
		Sub total	m	**7,949.0**	7,145.0
2	Reservoir	V=2x1,000 m^3	Nos.	**1.0**	

No	Items	Diameter	Units	Quantity (m)	
				Project Area	Subcenter Area
3	Pump Station	Q=6,000 m^3 /d	Nos.	**1.0**	
4	Secondary Connection		H.hold	**2,402.5**	7,051.0

Figure 44. Water Supply Layout Suggestion of Sharkhad



iv. Sewerage plan for Sharkhad

191. The wastewater generated from the area will be treated in CWWTP collecting through the collector main pipeline (D400 and 800 mm) which was installed at the south side of the project area.

192. Required length of sewer pipe to eliminate sewer has been computed as 3.5 km with D200~300 mm as shown in the below Table 41.

Table 41. Plan for Sewerage line (Sharkhad)

No	Items	Diameter	units	Quantity (m)	
				Project Area	Subcenter Area
1	Sewerage pipeline	Φ200	m	**2,590.0**	4,688.0
		Φ300	m	**1,260.0**	560.0
		Sub total	m	**3,850.0**	5,248.0
2	Secondary Connection		Household	**2,405.5**	7,051.0

Figure 45. Sewerage Layout Suggestion of Sharkhad

3. Heating network development for Sharkhad

i. District heating network design criteria

Heating load

193. Mongolian norm for planning and designing of district heating network is updated and approved in 2014 with new cipher number BNbD 41-02-13, which was replaced existing norm BNbD 41-02-05 with.

194. According to the norm, design heating load is to be calculated as sum of maximum space heating load, maximum ventilation heating load and average domestic hot water heating load.

195. Approximate unit heat load rate for both space heating and domestic hot water are given in the district heating network norm as a reference. Calculation of heating load for domestic hot water can be done based on hot water consumption in accordance with Mongolian norm “Building water supply, and sewerage system” BNbD 40-05-98.

Concrete trench and manholes

196. The concrete trench and manholes should be designed in accordance with industrial construction planning norm construction code of FSU 2.09.03-85, construction code of Mongolian 2.03.01-90 and steel structure norm construction code of FSU II-23-81.

197. All heating pipeline network installation design is considering loads and forces during operation and testing. Typical pre-cast concrete sections and pre-fabricated components fabricated in the factory in accordance with “Pre-fabricated concrete and reinforced concrete standard” MNS 2228–2002, use for concrete trench system of pipeline.

198. Water proofing measurement should be taken for concrete channels installed in ground water area including bituminous waterproof coating and channel joint filling.

199. Proper drainage system should be considered for concrete channels with pipe slope of not less than 0.003. Manhole floor level should not be less than 2 m below from ground level.

200. Depending on manhole area, number of covers shall be considered as following:

(i) Manhole area 2.6 m^2 ~ 6 m^2: two covers in diagonal position; and
(ii) Manhole area 6 m^2 and above: four covers.

ii. Design criteria for sub-stations

201. In each district, the sub-stations shall be installed to supply heat and domestic hot water for group of buildings. The subsidiaries of USUG and UBDN, government authority, shall operate the substations for heat and hot water and will be responsible for operation and maintenance of the substations during the operation period.

202. Basically, the sub-station is comprised of isolation valves, heat exchangers, pumps, expansion tanks, strainers, controls, pipe works, insulation, water quality control system and energy meter.

Standard Design and Configuration of Sub-stations

203. The sub-station package shall be included in following information:

(i) Type of heating medium and it’s parameter at the inlet and outlet of sub-station (Pressure and Temperature);
(ii) City water inlet and outlet pressure;
(iii) Heat exchanger type, required heat exchanger area, pressure losses and number of plates;
(iv) Pump station data including type, capacity and number of pumps;
(v) Water treatment system data including type, capacity and number;
(vi) Control system configuration and data; and
(vii) Electrical and power supply system including total installed capacity, type and power consumption calculation.

204. The sub-station building shall be designed in accordance with Industrial Building Norm BNbD 31-11-09.

205. The sub-stations should be equipped with heat exchangers, pumps, piping and valves, control system and should have the following functionalities:

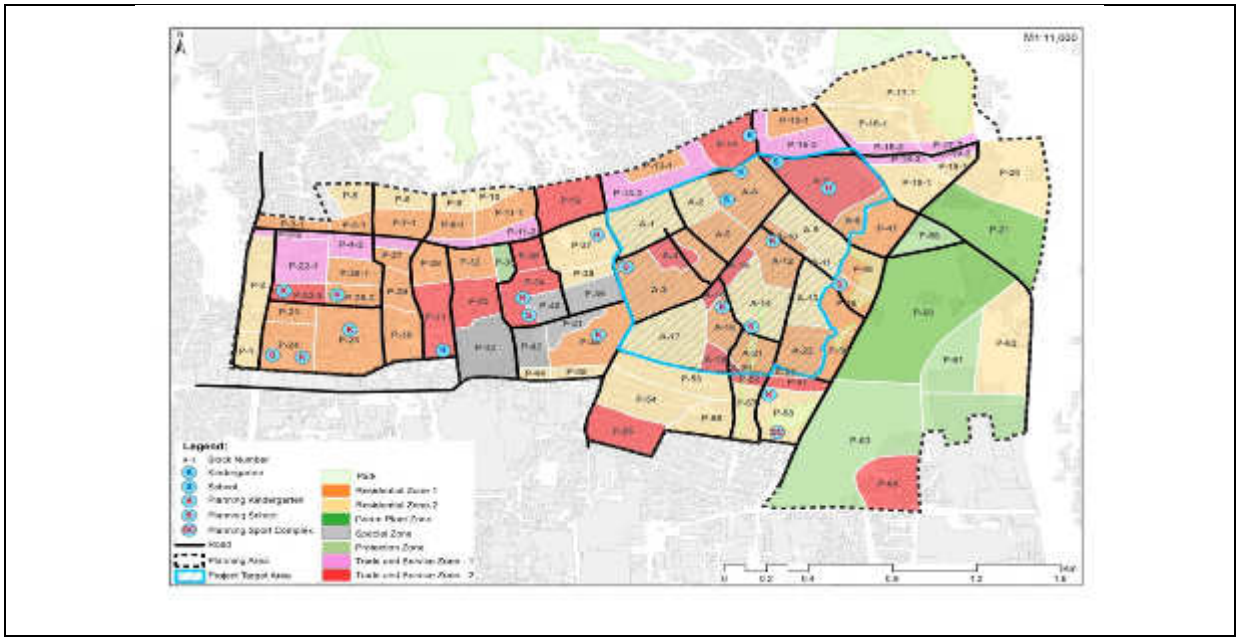
(i) Medium parameter change/control;
(ii) Monitoring of medium parameters;

(iii) Flow metering and heat metering;
(iv) Protection system; and
(v) System filling and feeding.

iii. Heat demand projection

206. Based on the urban planning of Sharkhad subcenter, the Consultants have defined the following new zones for urban planning for population of 56,707 persons which is divided into 19,742 persons for project area and 36,965 persons for subcenter area. The land use zoning with population (refer to Figure 46) has been utilized for heating demand projection.

Figure 46. Boundary and Urban Planning Zones of Sharkhad



207. The total heat demand of the Sharkhad was estimated based on the population. Estimated heat load is 82.93 MW, which may not be able to be covered with 1 heating source and be variable considering implementation schedule and plan of neighbored areas.

208. In this regard, the consultant has planned a phased investment plan for the heating supply as below for efficient supply plan, which consists of the largest part of the cost estimation. And the consultant has obtained information through consultation with the UB district heating company that Project area can be supplied with the remaining heating capacity of the Amgalan heating plant, which shall be officially confirmed by the UB district heating company.

209. Boundaries divided into two parts; project area and subcenter area are separately estimated and the Subcenter Area has divided into three phases for implementation efficiency and synchronizing with the future plans.

iv. Heat distribution network

210. The total planned facilities for heating distribution and heating demands are summarized in below table 42.

Heating supply network under project area.

211. The heating demand for the project area is 23.04 MW which is planned to be covered with the Amgalan Heating plant. The consultant have consulted with UB District Heating Network Company for obtaining the heating resource to supply the heating from the Amgalan Heating plant to the project area and Subcenter Area on 31 August 2019 and UB District Heating Network Company has confirmed the availability to supply both to the project area and Subcenter Area considering its expansion and air pollution reduction. However, considering the timing of the construction of project area and subcenter area, the design consultant for Tranche 3 shall consult with UB District Heating Network Company for availability during the design stage. And the connection point for the project subcenter supply is at Southern part of the subcenter and the heating will be distributed by the 2,584.0 m of heating pipelines.

Table 42. Heat Load Estimation of Sharkhad

Division	Heating Demands/MW/	HDS/quantity/	HDL/m/
Project area	23.04	3	2,584.0 (2xD150~700 mm)

212. The three heat distribution substations has been planned to cover the northern and southern parts of the subcenter, which is mostly composed the car market area as well as the commercial area with state mental hospital, public transportation end stop at the end of the boundary. Considering the above characteristics of the area, pipeline routes have been selected through basically road plan in urban planning data with the available corridor determined during site visit considering diverse topography, minimizing resettlement, and minimum cost path.

Figure 47. Heating Supply Network and Heat Distribution Subcenters – Project Area

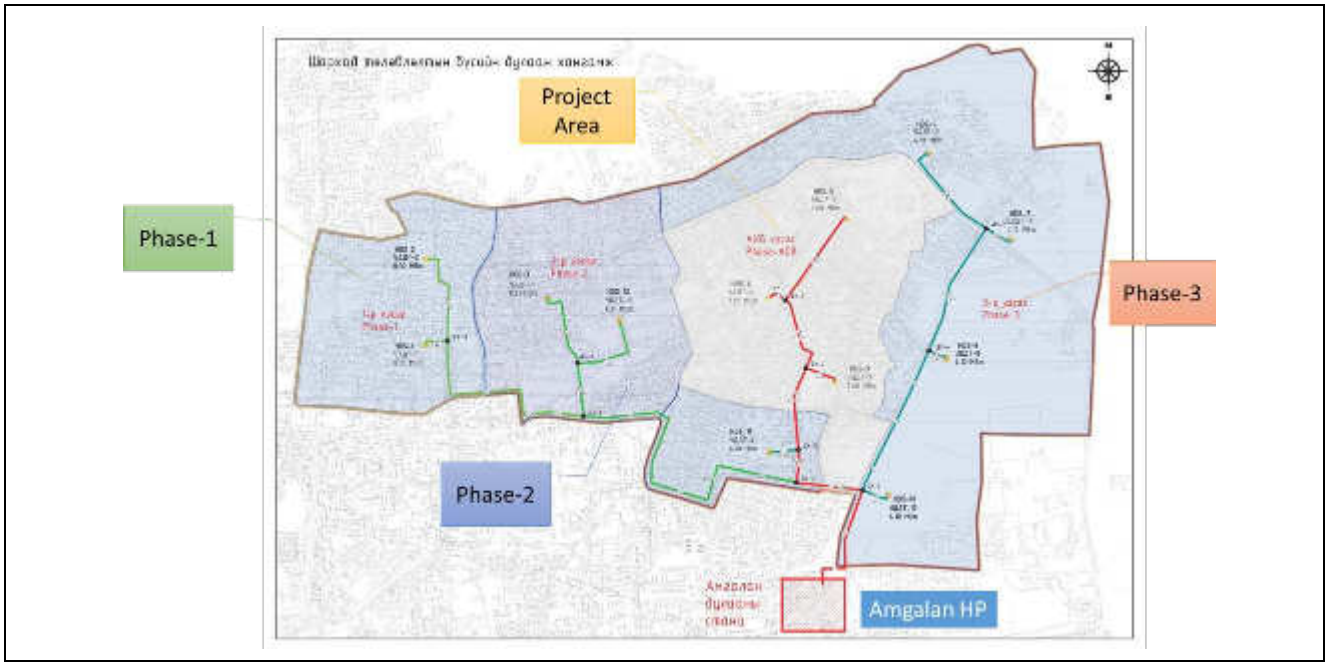
Heating supply network under subcenter area

213. The heating demand for the subcenter area is 53.57 MW and considering the fact that the different implementation schedule of the area outside project area is planned, the consultant has divided into three sections, which has been prioritized based on the developable orders from NOSK planned area to green space as below Figure 43.

Table 43. Planned Heating Supply Facilities

No	Division	Heating Demands /MW/	HDS /quantity/	HDL / m /
1	Phase 1 under Subcenter Area	16.61	2	6,621.0 m (D2x150~350 mm)
2	Phase 2 under Subcenter Area	16.42	2	
3	Phase 3 under Subcenter Area	20.50	5	
	Total	**53.53**	**9**	

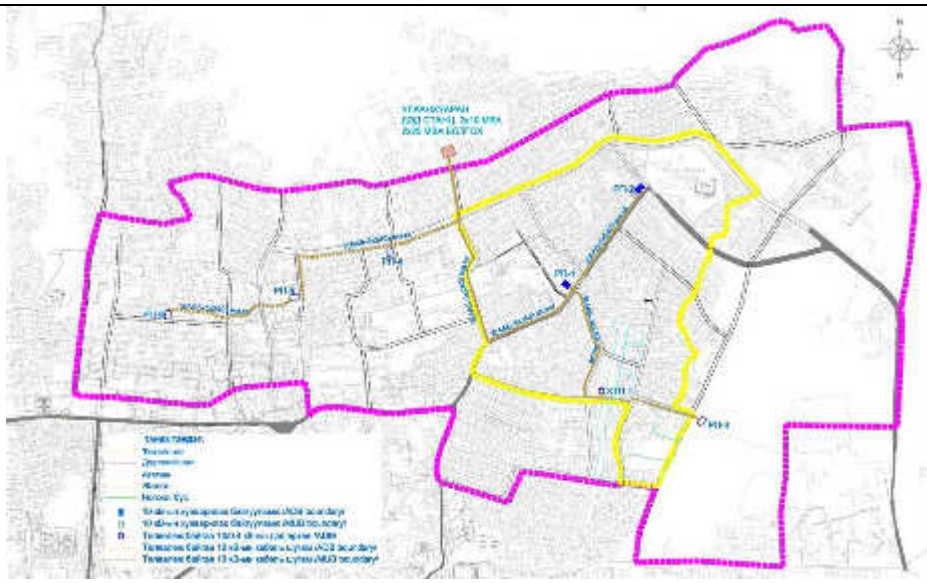
Figure 48. Heating Supply Network and Heating Distribution Subcenters –Subcenter Area



4. Power supply

214. Electricity consumption has been increasing due to the population density, active migration, urbanization and electricity night tariff cut to zero in Ulaanbaatar city. Ulaankhuaran substation has been working with its 60% of capacity for the last three years and initial capacity will be increased up to 32 MW.

Figure 49. Planning Electricity Supply of Sharkhad Subcenter.



215. Sharkhad subcenter is regionally planned with public facilities such as kindergarten, schools, residential and commercial areas. Total electricity load of currently existing consumers is 6.5 MW, but electrical load for Projected area is estimated as 10.2 MW, Subcenter area is 23.6 MW.

216. Two electricity switch gears with capacity of 10 kV each, 10 sets of closed type substations with transformer of 2x630 kVA power, 20 km long electricity transmission line with 10 kV capacity shall be built in order to supply this increasing population. (Figure 49)

5. Telecommunication

i. Telecommunication network planning

217. Telecommunication planning in Sharkhad under the feasibility study for Tranche 3 of Ulaanbaatar Urban Services and Ger Areas Development Investment Program has been prepared based on the following:

218. Mongolian construction code of “Regulation for urban planning and construction” CCR 30-01-04 and Mongolian standard of Concepts for information and telecommunication sector of “Reinforced steel concrete manhole for telecommunication” MNS 3966:1987, “Manhole for cables of telephone network and its technical requirement” MNS 5016:2001, “Plastic pipe for telephone channeling and its technical requirement” MNS 5017:2001, “Installation of information and telecommunication network in apartment buildings and its technical requirement” MNS 6581:2016, “Planning of information and telecommunication network in apartment buildings and its technical requirement” MNS 6580:2016 and “Detailed design of telecommunication cable lines” MNS 6305:2012.

219. Based on satisfying the needs of information telecommunication planning of 2020-2030, the infrastructure planning is to create the 4 pipelines of new lining on main roads and depending on the loading, some area will have 2 pipelines of lining. In between two manholes, distance will be less than 120 meters.

220. Depending on the loading of that area, there will be a two-store building has to be built for a storage of MHS's service center and 25-30-meter-tall tower will be built at the same time and connect it to the ATC45 station in City of Ulaanbaatar.

221. There will be a 4 pipeline of lining built to Botanical Garden region area along with main road. Depending on the loading of that area, there will be a single-store building has to be built for a storage of MHS's service center and connect it to the ATC45 station in City of Ulaanbaatar.

222. It has been planned that new duct will sent out 96 line of fiber optic from ATC 45 station to each information technology main centers.

223. The options of the information telecommunication's advanced technology and equipment cannot be decided at this moment due to needs of customers. Thus, it is left for the private sectors. Urban planning of the manhole, duct, cables, lining and equipment selection can be solved in shop drawing stage.

224. Based on the customer's needs, the planned main base communication network duct and lining can be used for bundle service of IPTV, portable network and internet for the family and offices. It will enable for customers to use the high-speed internet securely and network system will reach out without any obstacles. Based on the customer needs, there are one or more operational companies can serve via the main service center building.

Figure 50. Telecommunication Network Plan of Sharkhad Subcenter

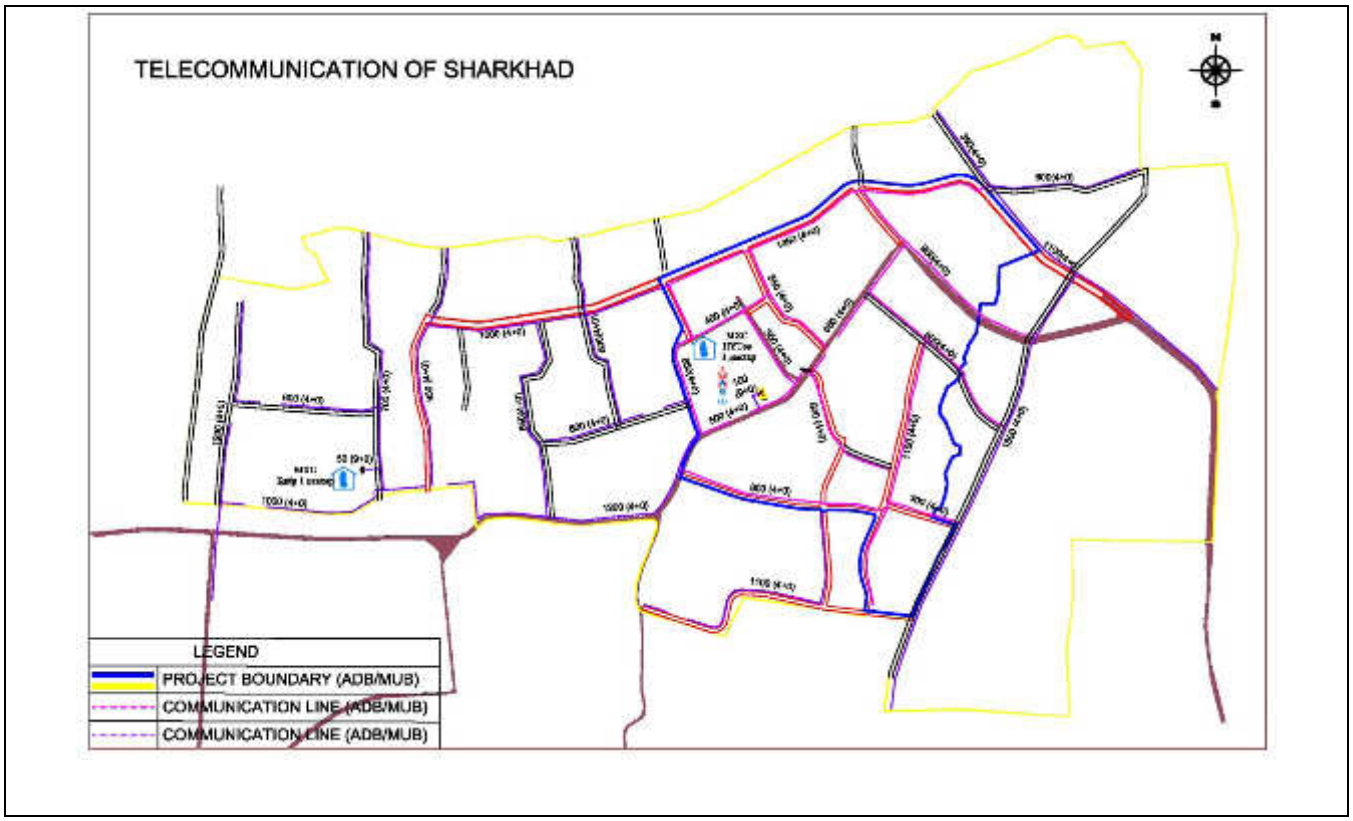


Table 44. Telecommunication Network Plan of Sharkhad Subcenter (Project Area)

No.	Item	Type	Unit	Quantity
1	Telecommunication's service and data center /3-storied building/ -1 pcs	(25x12 m)	m^2	1,008
3	Fiber optic cable	96 core	100 m	55.0
4	Primary duct (4+0), L5T type manhole /medium/	ф110 mm	100 m	88.5
5	Primary duct (9+0), M1 type manhole /large/	ф110 mm	100 m	1.0
6	Tower		25-30 m	1.0

Table 45. Telecommunication Network Plan of Sharkhad Subcenter (Subcenter Area)

No.	Item	Type	Unit	Quantity
1	Telecommunication's service and data center /3-storied building/ -1 pcs	(25x12 m)	m^2	1,008
2	Telecommunication's service and data center-/District/ 1 floor building	(6x12 m)	m^2	72
3	Fiber optic cable	96 core	100 m	105.0
4	Primary duct (4+0), L5T type manhole /medium/	ф110 mm	100 m	218.0
5	Primary duct (9+0), M1 type manhole /large/	ф110 mm	100 m	1.5
6	Tower		25-30 m	1.0

ii. Requirements for the Design

(i) Layout (Obtaining the layout from Capital City Information Fund);
(ii) Integrate other infrastructure lines planning;
(iii) Implement in accordance with the approved technical condition and design work instruction;
(iv) Make the drawing legends in accordance with the Mongolian standards of MNS:6305:2012 and MNS:4908:2000;
(v) Consistent with the Mongolian standard of "Planning of information and telecommunication network in apartment buildings and its technical requirement" MNS 6580:2016; and
(vi) The size of pipes and their distance will be planned in consistence with Mongolian construction code of "Regulation for urban planning and construction" CCR 30-01-04.

225. The section drawings of the special areas, areas with steep slope or areas crossing under the road shall be made in detail.

D. Proposed infrastructure development for Tolgoit subcenter

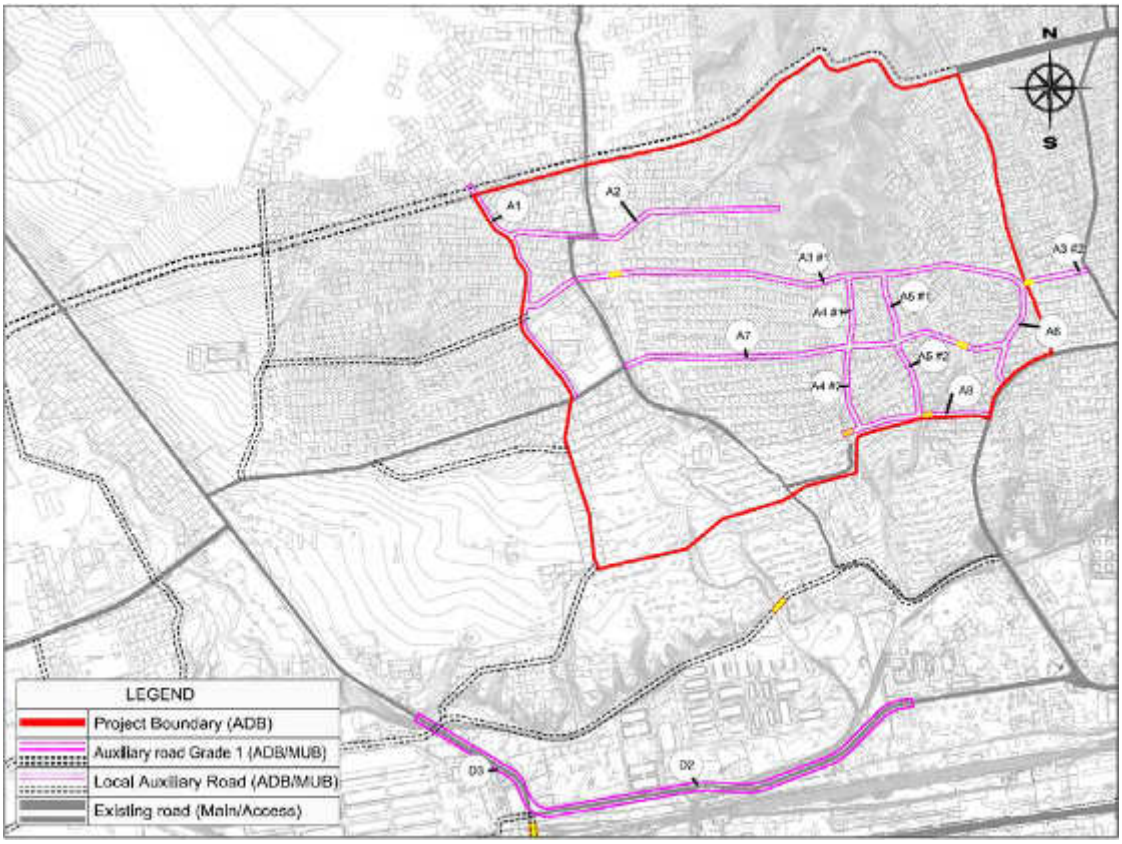
226. This chapter presents technical analysis covering draft engineering layouts and components with applicable design norms and codes.

1. Road and urban services development for Tolgoit subcentre

i. Overview

227. The project road plans must accommodate the existing situation and future plans to extent possible, so, the consultant has designed considering traffic circulation for the road network surrounding the development plan which has mentioned in Section 3, road network planning. In this regard, the consultant has prioritized the internal and external roads connecting to the center of the city that has the potential to develop the economy of Ulaanbaatar and accessible to the core area as well as the traffic variance.

Figure 51. Proposed Road Alignment Plan of Tolgoit (Project Area)



228. The consultant figured out that current road structure is quite dependent on the geographical conditions, such as steep slope landscape; thus, road formation cannot reach the network system. Hence, the roadway alignment has been developed based on the concepts; (i) maximum use of the existing road

for minimum resettlement, (ii) implementation of priority road from local needs in order to enhance the accessibility, and (iii) compliance with the Master Plan in addition to enhancing the site accessibility.

Table 46. Road Components of Tolgoit

Div.		Main road Grade 2 (Blue Line) (W = 24.7 m)		Local road (Purple Line) (W = 14.7 m)		Total
		Using Exist road network	Using Ger area	Using Exist road network	Using Ger area	
Project Area	Road	1.53 km	-	-	6.16 km	7.69 km
	Bridge	-	-	-	5 bridge (160 m)	160 m

229. In design perspective, it is crucial that road design has to be based on the Mongolian standards, which has been developed from many years of experience and accumulated data. From this section, the direction and basic criteria utilized for the concept design is elaborated with applied Mongolian road design standards.

ii. Geometric criteria

230. The roads in the Tolgoit subcenter formed as it is a narrow road shape following the typical formation of the Ger area. In addition, this area has no master plan of the MUB's that make up the road network, so the proposed road layouts within the project boundaries reflect the Mob's various road construction plans. The black dotted road plan which is outside the project boundary will be developed under the Mob's plan to connect the project roads inside the boundary.

231. In order to reduce the number of Affected Houses, existing roads were adopted utmost when planning the roads. Due to the geographical condition of this area the slope of the road is rather steep. Reducing the longitudinal slope of roads can be a way to decrease accidents during winter and downhill speeding, however, in order to reduce the resettlement of households, it is inevitable to implement the longitudinal road following the existing road. The longitudinal slope of roads was adjusted to satisfy road design standards for the Ger area and various traffic calming devices were studied to prevent accidents that may occur on a downhill slope.

Table 47. Design Standard of Subcenter Road

№	Design Parameter	Auxiliary road Grade 2		Local Collector Road	
		Existing MN Standards	Applicable	Existing MN Standards	Applicable
1	Design Speed	50 km/h	50 km/h	30 km/h	30 km/h
2	Right-of-Way	33	33	24.5	26
3	Carriageway Width	3.5 m	3.5 m	3.0 m	3.5 m
4	Total Formation Width	23	24.7	14.5	14.7
5	Shoulder Width (L guard+0.5 earth shoulder)	1.0	1.0	1.0	1.0

№	Design Parameter	Auxiliary road Grade 2		Local Collector Road	
		Existing MN Standards	Applicable	Existing MN Standards	Applicable
6	Camber of Carriageway	2.0%	2.0%	2.0%	2.0%
7	Camber of Shoulder	4.0%	4.0%	4.0%	4.0%
8	Minimum Horizontal Curve Radius	79	70	30 (25)	30
9	Min vertical Sag Curve	100	1000	400	400
9-1	Minimum Vertical Crest Curve	125	1000	500	350
10	Maximum Gradient	12	12	12 (15)	12
11	Minimum Gradient	0.3	0.3	0.3	0.3
12	Vertical Clearance	4.5	4.5	4.5	4.5
13	Minimum stopping sight distance	65	65	35	35
14	Maximum super-elevation	6	6	6	6

iii. Road alignment

Horizontal alignment

232. The horizontal alignment will be based on a design speed of 30 km/h. Curve radii of 30 m or greater are achievable.

Super-elevation

233. Super-elevation will be increased on horizontal curves on steep downgrades, as recommended in the Mongolian Geometric Design Manual. However, it is necessary to consider the application of the maximum 4% considering freezing of carriageway in the winter season as proposed by AASHTO's “Urban Arterial Road”. On curves where the radius exceeds 400 m (in case of design speed 30km/h) or 1,200m (in case of design speed 50 km/h), standard grade 2% will be used.

Vertical alignment

234. In Ger area route will have a maximum gradient of 12%. The ring road to the mental hospital will be posted at 50 km/h and will have a maximum gradient of 8%.

235. The crest curves will be designed for a speed of 30 km/h, which equates to a K value of 102. At Sharkhad ring road, the proposed K value will be 62, which equates to a design speed of about 50 km/h.

236. The adoption of a Mongolian sight-distance model provides relaxation of the current standards used above, such that the K value proposed for the crest curve is now appropriate for a design speed of 30 km/h.

237. Sag curves at intersections will have a minimum K value of 40, which significantly exceeds the normal comfort requirement for a 30 km/h design speed. Elsewhere on the main route, which will not be illuminated, a K value of 150 will be used for sag vertical curves, in accordance with the Mongolian Geometric Design Manual.

Vertical clearances

238. A 4.5 m vertical clearance will be provided to the undersides of all structures. Connections under the route for landowner access will have a nominal 3.5 m vertical clearance.

239. Base on the assessment of the Consultant, locations of bridges along the road were identified. Lengths of the bridges were tentatively fixed considering the nature of stream and banks type. A list of bridges required along the proposed alignment was prepared.

iv. Bridge design types used in Mongolia

240. Bridges have been constructed by Russian / Chinese Contractors in Mongolia since the 1960s in accordance with Russian Standard. Since the 1990's Mongolian contractors apply the Mongolian Standard which is based on the Russian Standard. After the 1990's Trunk Roads projects in Mongolia funded by the Asian Development Bank, the Kuwait Fund and Japanese Grant Aid apply various Design Standards such as American and Japan standards, etc.

241. New bridges on recent ODA projects were reinforced concrete and pressed concrete types. Major bridge projects in Mongolia are shown in the below table 48.

Table 48. List of Bridges Project in Mongolia

Location	Type	Constructed
Gurvaljin Bridge in Ulaanbaatar	RC T-beam girder	1989
Dambadarjaa Bridge in Ulaanbaatar	RC T-beam girder	1990
Ikh Tenger Bridge in Ulaanbaatar	RC T-beam girder	1994
Dambadarjaa Bridge in Ulaanbaatar	RC T-beam girder	1995
Dood Selbe bridge on Teeverchid	RC T-beam girder	2003

242. As mentioned above, most of bridges in Ulaanbaatar City are reinforced concrete bridges. And the most widely used superstructure, substructure, and foundation types in Mongolia are shown in below table 49.

Table 49. Bridge Design Types Used in Mongolia

Superstructure	Substructure	Foundations
Beam and deck slab Steel truss Steel plate girder	Massive PSC or masonry abutments and piers RCC abutments and piers	Open foundation Well foundation Pile foundation

Superstructure	Substructure	Foundations
Pre-stressed beam		

243. The choices of superstructure, substructure and foundation type were considered for each site taking into consideration geological site conditions, method of construction, availability of construction materials and manpower, construction costs of bridge, approach roads, etc. The following types of bridges were selected for the project roads and preliminary designs were prepared for each specific bridge.

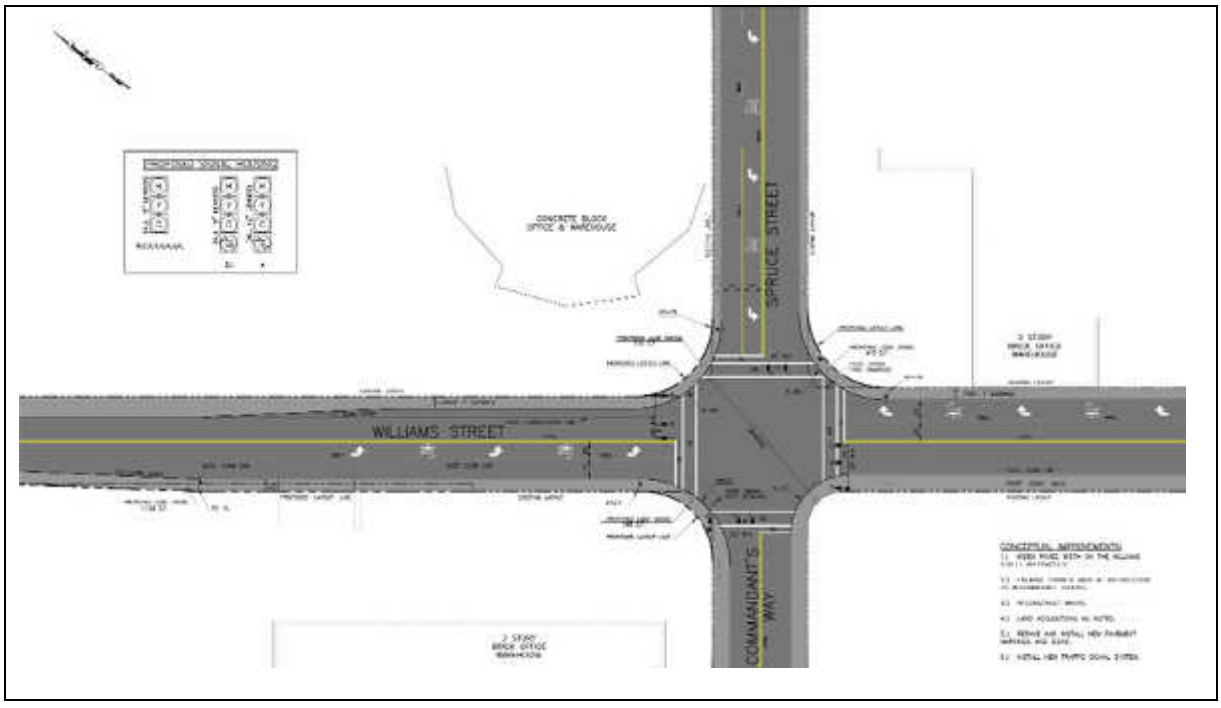
Table 50. Bridge Types in Project Area

Bridge Type	Single Span Length
Box bridge	Length up to 6 m
I-Beam bridge and deck slab with open foundation	Single span up to 25 m
Steel plate girder bridge with open or well foundation	Single span up 25 to 35 m
Pre-stressed T-bean bridge with well foundation	Single span more than 40 m

v. Intersection plan

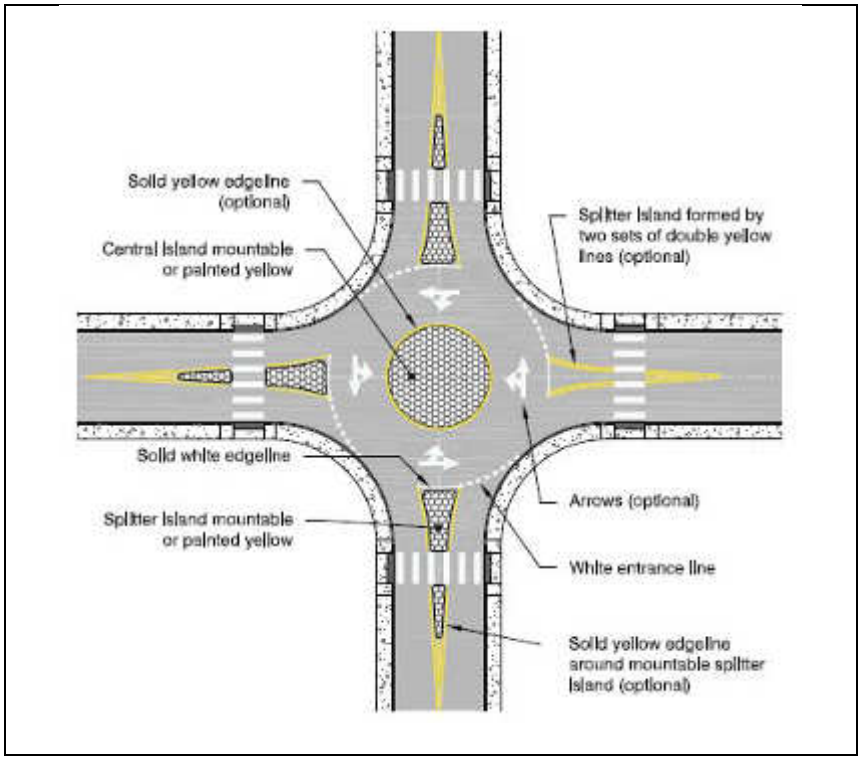
244. Location of Intersections will be reviewed in accordance with the Mongolian design standard, as detailed in “Planning for urban, street and road” (CCM 32-01-04).

Figure 52. Typical Intersection Plan in Urban Street



245. Basically, it is planned as an at-grade junction at the intersection of roads. But, in order to reduce signal waiting time and air pollution, it is necessary to consider the applicability of roundabout in the later design stage.

Figure 53. Typical Roundabout Plan in Urban Street



246. Considering the implementation of a roundabout, the at-grade components of intersections are likely to be either large roundabouts, or dumbbell roundabouts. These will all be designed in accordance with Mongolian guidelines. Key design parameters for roundabouts are:

(i) Dumbbell roundabouts have a central island diameter of 40 m;
(ii) Sensitivity analyses are undertaken to determine optimum diameters and desirable performance;
(iii) Roundabouts will generally have two lanes, with a 10 m circulating width, but single lane operation has also been considered;
(iv) Approach and exit speeds have been considered to be lower than 30 km/h;
(v) Typical gap acceptance parameters have been used;
(vi) Ideal ramp gradients should be no more than 6%; and
(vii) Minimum lane widths on ramps and roundabouts are to be 3.5 m.

vi. Drainage plan

247. Drainage is built on the proposed roads, but rainwater cannot be completely removed. Thus, the Consultant can work with international consulting engineers to achieve infrastructure plans for roads, bridges, pipelines, drainage, heating lines, and other infrastructure and achieve international standards.

248. Good drainage is a prerequisite for a safe road in a hilly area, safe discharge of collected rainwater is another important aspect in designing a road. Usually, the capacity of a drain is calculated by using

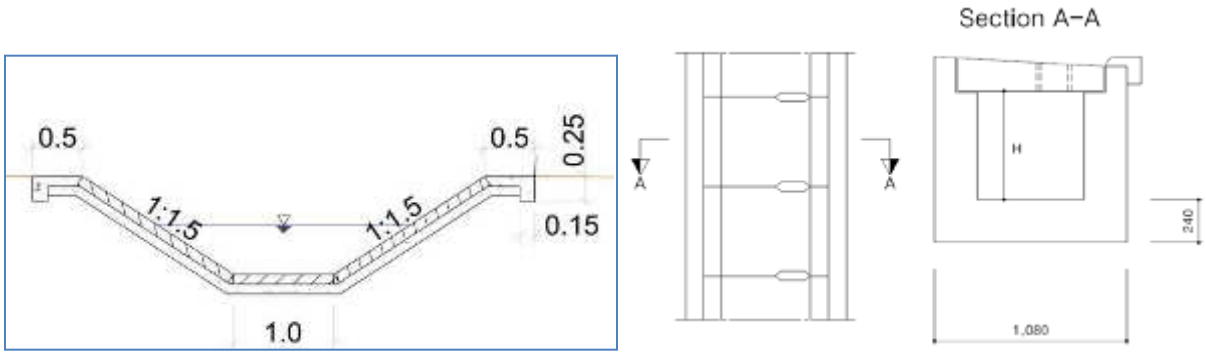
various techniques. The use of rational formula and Manning's law for velocity calculation is widely used in the road drainage design.

249. Storm water on the road surface in the project area drained to the existing channels and rivers. At the Sharkhad subcenter, the end of the drainage system is connected to existing drainage on Da Khuree Street and Sharkhad street, which runs through the Sharhad subcenter.

Longitudinal drains

250. Rainwater collected along with the formation of the road as well as from the hill slopes should first be channelized through the longitudinal drains constructed along the alignment of the road. The main slope of the drain should be at least 0.3%, and the slope drainage which is more than 4% should be designated as an open channel. (10.3.7 and 11.3.2 ZZBNbD 22-004-2016). There are many types of drain designs, all such typical designs are produced and given in the drawing form.

Figure 54. Open Channel and Trench Section



Cross drainage works

251. Cross drainage works such as culverts and pipes are required to either safe discharge of the collected water along the road or they are required to connect to the existing natural drainages such as creeks and rivulets etc. Typical designs of such structures are produced as drawings.

vii. Traffic calming

252. The speed of the motorized traffic is the parameter that is easiest to influence in securing a safe road. This involves not only the vehicle speed on approach to the intersection but also the speed passing the site. In many situations of intersection accidents in the Ger area, speed restrictions are in fact the only measure available to solve the problem.

253. Traffic calming devices designed to slow cars down on Ger area roads can provide a safe and comfortable road environment for pedestrians. In particular, among the types of devices for lowering the speed of the car on the road of Ger area formed on steep slope, the speed reduction facility which induces the deceleration of the car by using the vertical step or the change of the horizontal alignment can be effective. Such a facility can be installed with guide signs rather than being installed alone, to attract the driver's attention and increase the speed reduction effect. Traffic-calming devices can be grouped as below in Table 51.

Table 51. Traffic Calming Devices

Categories	Description	Applied
Speed Bumps	A speed bump is a raised area in the roadway pavement surface extending transversely across the travel way, generally with a height of 3 to 6 inches and a length of 1 to 3 feet.	O
Speed humps	A speed hump is a raised area in the roadway pavement surface extending transversely across the roadway. Speed humps normally have a minimum height of 3 to 4 inches and a travel length of approximately 12 feet, although these dimensions may vary. In some cases, the speed hump may raise the roadway surface to the height of the adjacent curb for a short distance.	O
Raised crosswalks	Raised crosswalks are essentially broad, flat-topped speed humps that coincide with pedestrian crosswalks at street intersections. The crosswalks are raised above the level of the roadway to slow traffic, enhance crosswalk visibility, and make the crossing easier for pedestrians who may have difficulty stepping up and down curbs.	O
Raised intersections	Intersection humps raise the roadway at the intersection, forming a type of "plateau" across the intersection, with a ramp on each approach. The plateau is at curb level and can be enhanced through the use of distinctive surfacing such as pavement coloring, brickwork, or other pavements. In some cases, the distinction between roadway and sidewalk surfaces is blurred. If this is done, physical obstructions such as bollards or planters should be considered, restricting the area to which motor vehicles have access.	X
Mini Roundabout	These are small roundabouts, which are sometimes simply painted intersection controls. Central islands can be flat or raised. Where these are used to slow traffic before reaching other traffic calming features, the amount of deflection will determine the speed reduction gained.	Δ
Rumble Strips	Rumble strips are a series of closely spaced raised individual bars or patches that alert drivers, visually and audibly, of the need to slow down. Cyclists' needs should be considered in the design of rumble strips.	Δ
Rumble Wave	In a similar style to rumble strips, the surface pattern of rumble waves can be varied using a sinusoidal profile to generate horizontal vibration in the vehicle but very little external noise. The profile of the pattern can be varied to match the desired speed.	X
Signs	Road signs are widely used to manage and control traffic. Signs often supplement other traffic calming features, but, used alone, it is not clear how effectively they calm traffic.	O
Road narrowing	Reducing the available road space for drivers can lower traffic speeds. Narrowing the road by re-allocating space to pedestrians and/or cyclists is one way of doing this.	X

*** O : Applicable, Δ : Can be applied after the investigation of site and noise inducing factors, X : Difficult to apply due to high cost, AHs and low efficiency.**

254. Traffic calming devices can be installed in areas that require speed reduction to protect children such as schools and kindergartens, and in areas that adjacent to commercial areas with heavy traffic.'

viii. Bridge plan

255. The road alignment study and bridge site inspections determined that five new bridges would be required. Engineering surveys were carried out with all new sites to prepare the preliminary designs.

Table 52. List of Bridge in Tolgoit Subcenter

No.	Road No.	Width	Length	Cross
1	A3	15.3 m	40.0 m	Ravine + sidewalk
2	A3	15.3 m	30.0 m	Ravine + sidewalk

No.	Road No.	Width	Length	Cross
3	A7	15.3 m	30.0 m	Ravine + sidewalk
4	A8	15.3 m	30.0 m	Ravine + sidewalk
5	A8	15.3 m	30.0 m	Ravine + sidewalk

Selection of component type

256. In this study, outline designing is implemented based on the design standards below. Allowable stress design method is used considering uncertainty of material properties.

(i) Superstructure: I-Beam and deck slab;
(ii) Substructure: RCC abutments and piers; and
(iii) Foundation: Open foundation.

2. Water supply and sewerage plan for Tolgoit

i. Design options and standards

257. Each of micro subcenters shall be planned to be supplied directly through the pipes that are connected with the main water and sewerage network of Ulaanbaatar city. This will help to:

(i) Attract new private, commercial enterprises and other organizations to settle within the area;
(ii) Enhance willingness to connect of private and commercial customers; and
(iii) Increase land value.

258. The main concept for the planning of water supply and sewerage pipes shall be to minimize the affected households and compensation costs. This would be also convenient for further maintenance and to install under the newly planning road or under the pedestrian walkway preferable.

259. The planning of the pipe network shall be organized that can give benefits for all of residents and connect to all of public facilities such as schools, kindergartens and hospitals. The existing kiosks in the subcenters are the main water source for the residents; therefore, it will keep their operation until the newly planning water supply system begins to supply.

260. Mongolia has an extreme continental climate with higher temperature changes during the summer and winter, especially the freezing accidents occurs frequently on the existing water supply and sewerage facilities due to the extremely cold winter. Therefore, it shall be possible to take a measurement preventing from that kind of accident.

(i) Installation depth of the pipes shall be defined considering the freezing depth (2.5~3.5 m);
(ii) Heat reserving measurement shall be prepared for the pipes; and
(iii) The pipes with good quality and durability shall be selected (Steel wire Reinforced Thermoplastic composite Pipe (SRTP), Steel PIPE(SP), Ductile Iron Pipe (DIP).

Water supply networks and adjuncts

261. Profiles of trenches should be according to Norms BNbD3.05.04-90; BNbD3.02.01-90; BNbD3.01.01-89; BNbD3.01.03-88; BNbD3.01.05-90 and other. The invert for individual water and sewer pipes is set at -3.0m from soil level. Local variations can be admitted as a function of local soil topography changes. Steeper slopes up to vertical shall be accepted if special construction procedures shall be applied, including wall sustainment with jacks.

262. SRTP, which is currently recognized as high performance in Ulaanbaatar city, is supposed to be used for the distribution network, and the size of pipelines will be more than 150mm considering the future extension. All pipe works include joints, bends, manholes, valves and fire hydrants.

263. Estimate of costs for digging and refilling of trenches has been carried out on the base of construction norms currently applied according to the above-mentioned standards and other relevant regulations and laws.

Sewerage network

264. DIP sewerage pipes with minimum 200 mm diameter shall be used. The Invert for sewer pipes is planned at -3.0m below average soil level.

265. It shall be planned keeping the appropriate distance with other utility lines since it is installed neighboring with the pipelines of water supply and heating, and a measure shall be taken at the area where it is crossed over the other pipes and facilities during the designing stage.

ii. Water demand estimation

Selection of daily consumption rate per person

266. For the estimation of water demand in targeted areas, the consultant uses the average daily consumption rate 200LCD per one person from BNBD 40-02-16.

Table 53. Daily Water Consumption Rate Per Person

Convenience level of District apartment building	BNBD 40-02-16 (L/per day)	UBMP 2030 (L/per day)	Applied
Housing with sewerage, drinking water pipeline but no bath and shower	100-150	230	200
Housing with sewerage, drinking water pipeline and bath and shower	130-180		
Housing connected with central pipeline network which has sewerage and drinking water pipeline	150-220		
Ger area supplied from water kiosk, well and spring	25-40	25	25

* Source: Water Supply Pipeline Network and Facilities(BNBD 40-02-16).

Water Demand Estimation

267. With population data at each block, the estimation results of water demand is as below table. In total, 99,300 planned population needs 16,000 m^3 per day of water supply and 14,700 wastewater treatment.

Table 54. Water Demand Estimation

Area		ha	Planning population	Daily average water consumption (m^3/day)	Daily Maximum water consumption (m^3/day)	Daily average wastewater generation (m^3/day)
Sharkhad	Project Area	124.0	19,742.0	3,900.0	4,700.0	4,300.0
	Subcenter Area	383.4	36,965.0	7,400.0	8,800.0	8,100.0
Tolgoit	Project Area	158.1	14,964.0	3,000.0	3,600.0	3,300.0
	Subcenter Area	603.2	22,164.0	4,400.0	5,300.0	4,900.0
Total	Project Area	282.1	34,706.0	6,900.0	8,300.0	7,600.0
	Subcenter Area	986.6	59,129.0	11,800.0	14,100.0	13,000.0

Table 55. Water Demand Estimation of Tolgoit

Block No.	Area (ha)	Density	Planned Population (p)	Planned household	Daily water demand (200 l/c/d)	Daily max. (x1.2, m^3/day)	Wastewater Generation (m^3/day)
Project Area							
A-1-1	19.38	65.0	1,542.4	385.6	308.5	370.2	339.3
A-1-2	10.23						
A-1-3	17.64	66.0	1,406.1	351.5	281.2	337.5	309.3
A-1-4	8.55	220.0	1,414.8	353.7	283.0	339.6	311.3
A-1-5	0.59						
A-1-6	1.70						
A-2	1.89	220.0	313.0	78.3	62.6	75.1	68.9
A-3	5.91	220.0	977.1	244.3	195.4	234.5	215.0
A-4	2.21	170.0	373.0	93.2	74.6	89.5	82.1
A-5	2.42	170.0	408.4	102.1	81.7	98.0	89.8
A-6	5.20	170.0	879.4	219.8	175.9	211.1	193.5
A-7	3.85	170.0	651.4	162.9	130.3	156.3	143.3
A-8-1	2.13	220.0	351.9	88.0	70.4	84.5	77.4
A-8-2	1.04	110.0	76.3	19.1	15.3	18.3	16.8
A-9-1	15.04	65.0	1,206.0	301.5	241.2	289.4	265.3
A-9-2	3.00	110.0	219.9	55.0	44.0	52.8	48.4
A-10-1	9.43	65.0	755.9	189.0	151.2	181.4	166.3
A-10-2	1.52	220.0	251.4	62.8	50.3	60.3	55.3
A-10-3	4.00	110.0	293.5	73.4	58.7	70.4	64.6
A-11-1	9.79	65.0	784.7	196.2	156.9	188.3	172.6
A-11-2	5.28	220.0	873.5	218.4	174.7	209.6	192.2
A-12	2.71	65.0	217.5	54.4	43.5	52.2	47.8
A-13	2.63	65.0	211.2	52.8	42.2	50.7	46.5
A-14	4.28	65.0	343.2	85.8	68.6	82.4	75.5
A-15	6.44	65.0	516.2	129.1	103.2	123.9	113.6
A-16	5.79	65.0	464.0	116.0	92.8	111.4	102.1
A-17	5.41	65.0	433.7	108.4	86.7	104.1	95.4

Block No.	Area (ha)	Density	Planned Population (p)	Planned household	Daily water demand (200 l/c/d)	Daily max. (x1.2, m^3/day)	Wastewater Generation (m^3/day)
S/Total	**158.1**	**3,046.0**	**14,964.5**	**3,741.1**	**3,000.0**	**3,600.0**	**3,300.0**
							Subcenter Area
All	**603.2**	**3,616.4**	**22,164.0**	**6,380.3**	**4,400.0**	**5,300.0**	**4,900.0**
Total	**761.2**	**6,662.4**	**37,128.5**	**10,121.4**	**7,400.0**	**8,900.0**	**8,200.0**

Firefighting water

268. According to the norm BNBD 40-02-16 described in below, Subcenter Area should secure minimum 2 x 25 liters/second, 3 hours (324 m^3/day) of firefighting water.

Table 56. Firefighting Water

Urban and local area population number, 1,000 person	Number of the fire occurs	In urban area water usage for outside one fire occur	
		Two or below floor buildings, regardless of fire resistant	Three or more floor buildings, regardless of fire resistant
Until 1	1	5	10
1-5	1	10	10
5-10	1	10	15
10-25	2	10	15
25-50	2	25	25
50-100	2	-	35
100-200	3	-	40
200-300	3	-	55
300-400	3	-	70
400-500	3	-	80
500-600	3	-	85
600-700	3	-	90
700-800	3	-	95
800-1000	3	-	100

* Source: Water Supply Pipeline Network and Facilities (BNBD 40-02-16).

iii. Water supply plan for Tolgoit

269. In Tolgoit area, the water is supplied through Tolgoit Pump Station (288 m^3/h) from Central source. Furthermore, the expected water volume (3,300 m^3/day) is planned to be supplied from the newly planned Tolgoit reservoir (MUB plan).

270. Total required pipe length is 2.9 km with D150~300mm to compose water supply network of project area, and its details are shown in the below table.

271. According to an official letter from USUG sent on 11 September 2019 (Ref. 212266), the D110 is planned to be extended D250 and the pump station will be expanded.

Table 57. Plan for Water Supply Line (Tolgoit)

No	Items	Diameter	units	Quantity (m)	
				Project Area	Subcenter Area
1	Water supply pipeline	Φ150	m	**560.0**	240.0
		Φ200	m	**0.0**	6,108.0

No	Items	Diameter	units	Quantity (m)	
				Project Area	Subcenter Area
		Φ300	m	**2,340.0**	2,320.0
		Sub total	m	**2,900.0**	8,668.0
2	Expand water supply pipe	Φ110- Φ250	m		941.0
3	Pump station	4,600 m^3/d	Nos.	**1**	
4	Secondary Connection		H.hold	**1,870.6**	3,190.2

Figure 55. Water Supply Layout Suggestion of Tolgoit

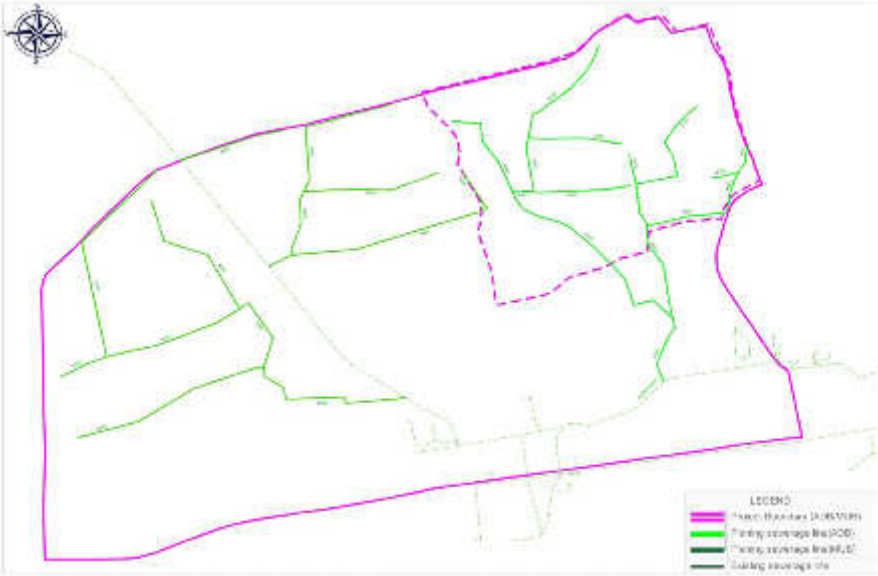
iv. Sewerage plan for Tolgoit

272. The sewerage generated from the area will be treated in CWWTP connecting the pipelines with nearby collector main pipeline (D500 mm) which is installed at the south side of the project area. Required length of sewer pipe to discharge sewage has been computed as 9.5 km with D200~300 mm as shown in the below Table 58.

Table 58. Plan for Sewerage Line (Tolgoit)

No	Items	Diameter	Units	Quantity (m)	
				Project Area	Subcenter Area
1	Sewerage pipeline	Φ200	m	3,910.0	7,348.0
		Φ300	m	2,650.0	1,290.0
		Sub total	m	6,560.0	8,638.0
2	Secondary Connection		Household	1,870.6	3,190.2

Figure 56. Sewerage Layout Suggestion of Tolgoit



v. Flood protection

273. Ulaanbaatar city is surrounded by high mountains and is subject to the risk of potentially hazardous flooding. Due to the floods in 1982 and 2009, households and organizations in Chingeltei, Khailaast and Tolgoit districts of Ulaanbaatar city were heavily flooded and caused damage to life and property.

274. Majority of people living in flood-prone areas of Tolgoit subcenter are migrants from rural areas and low-income people living in urban areas who are a lack of awareness of flood hazards. Large number of this group includes children, elderly people and disabled people.

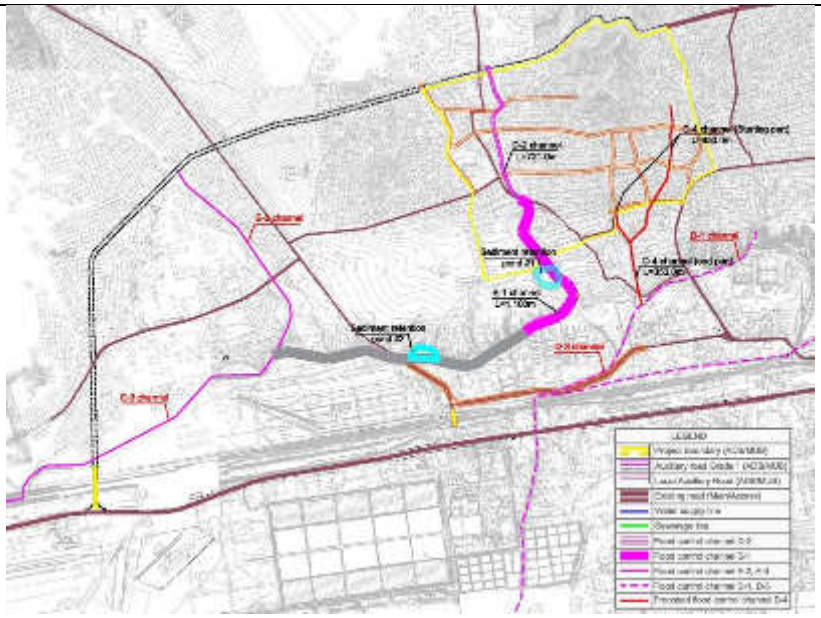
Figure 57. Flood Ravine and Channels in Tolgoit

	
Flood ravine running through Ger area of Tolgoit	***Current Condition of Channel maintenance (filled with sediments and rubbish)***

Measures taken for flood protection

275. Tolgoit subcenter in Songinokhairkhan district, Ulaanbaatar city was seriously damaged in the 1982 and 2009 floods. Detailed drawings of flood protection channel in Bayangol – Naran was performed in 2011 by Usnii-Erchim LLC. This design is intended to be a total of 14,523 meters of flood protection channel in nine parts. However, D-2 channel with a length of 721 meters, E-1 channel with a length of 1,100 meters and two sediment retention ponds haven't constructed yet.

Figure 58. Plan for Flood Protection



276. In addition, the 890-meter D-3 channel does not function properly due to lack of regular maintenance and cleaning as shown in Figure 58, which is required to be managed by relevant department of Ulaanbataar.

Proposed flood protection plan

277. Flood control measures and sediment retention ponds were planned in accordance with the master plan, proposed road and water supply, sewerage network of Tolgoit subcenter.

278. Accordingly, the measurement for flood protection and prevention is planned using the u-type open channel to be installed at both sides of new roadway to drain the storm water, which inflows from in and outside of the project area, and also improve the existing natural water course into precast concrete channel.

279. The total of 1,300-meter flood control reinforced concrete channel was planned to drain storm water from road and streets.

280. The flood protection channel was selected based on the geographical condition and size of ravines and riverbeds.

Figure 59. Plan for Flood Protection (Tolgoit)

No	Name of channel	Width of channel bottom /m/	Quantities	Units
1	D-4 channel (starting part)	1	950	m
2	D-4 channel (ending part)	2	350	m
3	D-2 channel	3	721	m
4	E-1 channel	4	1100	m
5	Sediment retention pond	-	2	Nos.

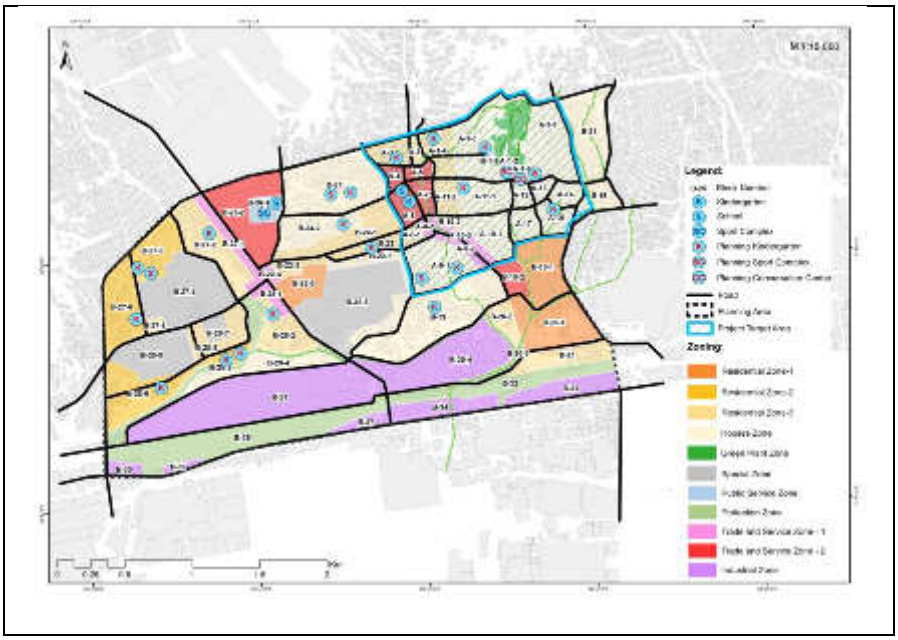
281. By taking the flood control measures, residents around the Tolgoit area will be protected from potential natural disasters, property and life risks, and provide a comfortable as well as safe environment.

3. Heating network development for Tolgoit

vi. Heat demand projection

282. There is no partial planning developed for the project scope area of Tolgoit. Only Ulaanbaatar Development Master Plan 2030 has projected general projection for this area.

Figure 60. Urban Planning Zones of Tolgoit



283. The total heat demand of the Tolgoit was estimated based on the population. The heating demands for the Tolgoit subcenter is estimated at 75.08 MW which is divided into 17.95 MW for project area and 57.13 MW for the Subcenter Area. No.4 Heating Plant has sufficient heating capacity to partially

supply to the Tolgoit subcenter, the size and capacity of heating plant can be reduced. Ulaanbaatar Development Master Plan 2030 has projected general projection for this area.'

284. Connection to the existing heating network would significantly reduce the cost and complexity of providing heat to new areas, but unfortunately is not possible everywhere. The Ulaanbaatar City Master Plan for 2030 has identified areas that will not be feasible for connection to the existing district heating system and that will require development of independent systems.

vii. Heat distribution network

Heating supply network under project area

285. The heating demand for the project area is 17.92 MW which is planned to be covered with the No.4 Heating Plant. The consultant have consulted with UB District Heating Network Company for obtaining the heating resource to supply the heating from the Heating Plant No. 4 to the project area and subcenter area on 31 August 2019 and UB District Heating Network Company has confirmed the availability to supply both to the project area and Subcenter Area considering its expansion and air pollution reduction. However, considering the timing of the construction of project area and subcenter area, the design consultant for Tranche 3 shall consult with Ulaanbaatar District Heating Network Company for availability during the design stage.

286. The four heat distribution subcenter (HDSs) has been planned to cover the northern and southern parts of the subcenter, which is mostly composed the car market area as well as the commercial area with state mental hospital, public transportation end stop at the end of the boundary. Considering the above characteristics of the area, pipeline routes have been selected through basically road plan in urban planning data with the available corridor determined during site visit considering diverse topography, minimizing resettlement and minimum cost path.

Table 59. Heat Load Estimation of Tolgoit (Project Area)

Division	Heating load/MW/	HDS/quantity/	HDL/m/
Project Area	17.92	4	4,479.0 m (2x D150~700 mm)

Figure 61. Heating Network and Heat Distribution Substations – Project Area

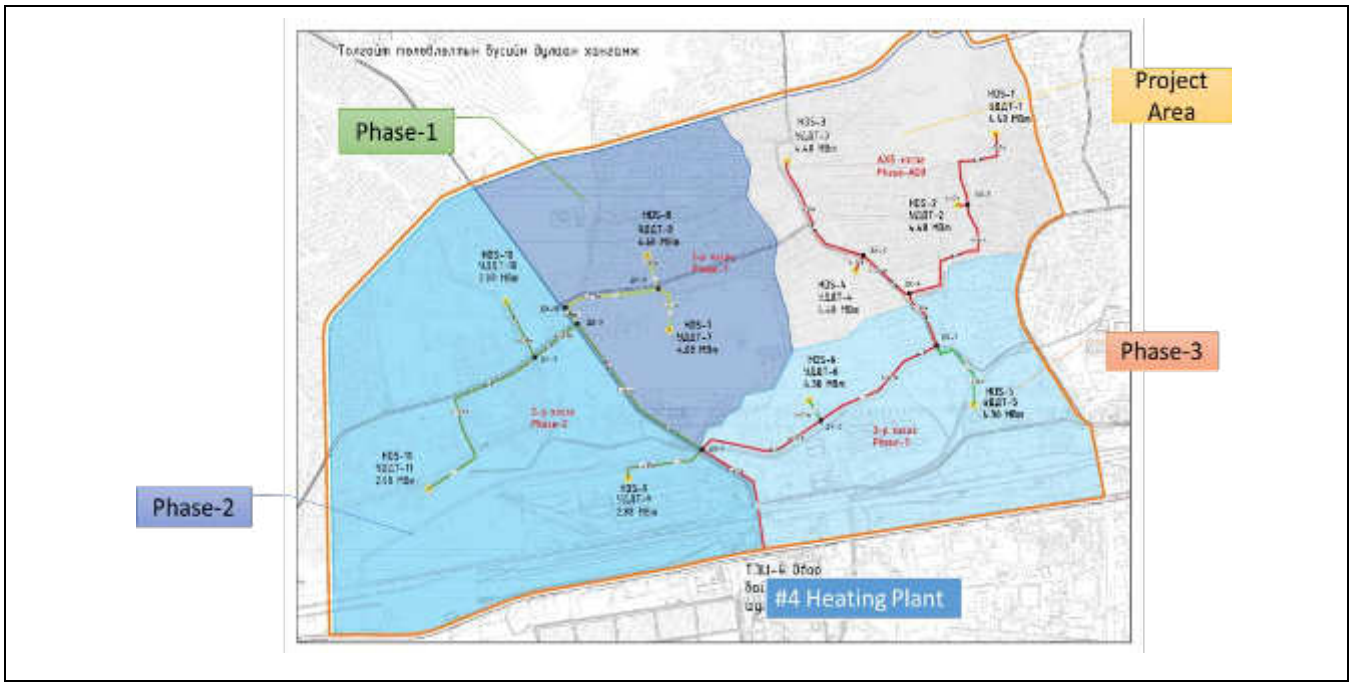
Heating Supply Network under Subcenter Area

287. The heating demand for the Subcenter Area is 26.60 MW, which has been estimated with the population data developed, and considering the fact that the different implementation schedule of the area outside project area is planned, the consultant has divided into 3 sections, which has been prioritized along with the proposed multiple economic nodes across the Tolgoit subcenter as below figure.

Table 60. Heat Load Estimation of Tolgoit (Subcenter Area)

Division		Heating load/MW/	HDS/quantity/	HDL/m/
1	Phase 1 under Subcenter Area	9.36	2	4,315.0 m (2xD150~700 mm)
2	Phase 2 under Subcenter Area	8.64	3	
3	Phase 3 under Subcenter Area	8.60	2	
	Total	**26.60**	**7**	

Figure 62. Heating Network and Heat Distribution Subcenters – Subcenter Area



The heating will be distributed by the 4,315.0 m of heating pipelines. Totally 7 heat distribution subcenters are planned to cover the remaining area, which is mostly comprised the residential area. Pipeline routes have been selected through basically road plan in urban planning data with the available corridor determined during site visit considering diverse topography, minimizing resettlement and minimum cost path.

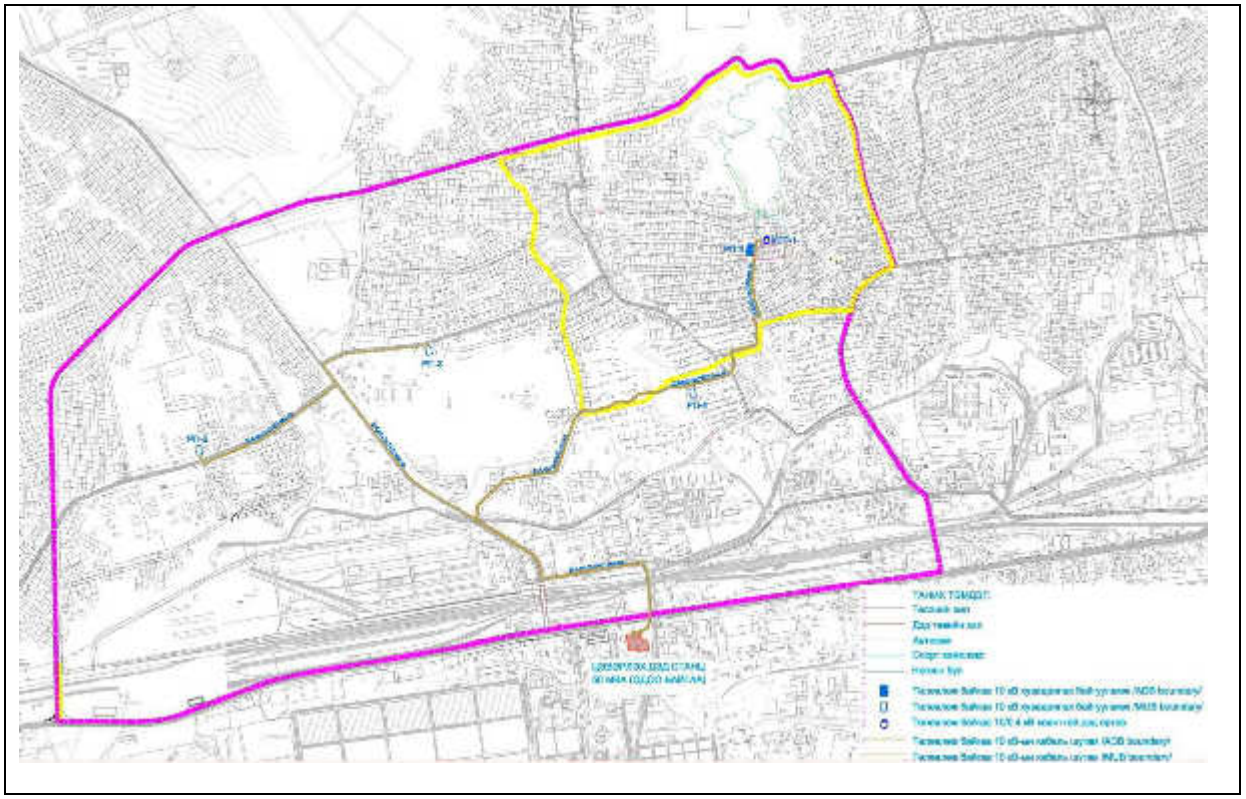
4. Power supply

288. Electricity consumption has been increasing due to the population density, active migration, urbanization and electricity night tariff cut to zero in Ulaanbaatar city.

289. Electricity load of the Tolgoit subcenter was designed in compliance with the Ulaanbaatar 2020 master plan and development approach for 2030 approved by the government of Mongolia in 2013. Tseverlekh substation has been operating with its 60% of capacity for the last three years.

290. According to Ulaanbaatar 2020 master plan and development approach for 2030 approved by the Government of Mongolia in 2013, Ulaanbaatar city was designed to be supplied from existing 14 substations along with planned “Ikh toirog -110KV” substation. Construction of “Ikh toirog -110KV” substation was started in 2012 and majority of the facilities and cables were installed, however, due to the right of way issues in coupe of areas the remaining construction is postponed till today.

Figure 63. Planning Electricity Supply of Tolgoit Subcenter.



291. Tolgoit subcenter is regionally planned with public facilities such as kindergarten, schools, residential and commercial area. Total electricity load is estimated as 7.9 MW for of projected area and 11.7 MW for subcenter area.

292. One piece of electricity switch gear with 10 KV capacity, eight sets of closed type substations with transformer of 2x630 kVA power, 15 km long electricity transmission line with 10 kV capacity shall be built in order to supply this increasing population.

5. Telecommunication

i. Telecommunication network plan of Tolgoit subcenter

293. Telecommunication planning in Tolgoit under the feasibility study for Tranche 3 of Ulaanbaatar Urban Services and Ger Areas Development Investment Program has been prepared based on the following standards: Mongolian construction code of “Regulation for urban planning and construction” CCR 30-01-04 and Mongolian standard of concepts for information and telecommunication sector of “Reinforced steel concrete manhole for telecommunication” MNS 3966:1987, “Manhole for cables of telephone network and its technical requirement” MNS 5016:2001, “Plastic pipe for telephone channeling and its technical requirement” MNS 5017:2001, “Installation of information and telecommunication network in apartment buildings and its technical requirement” MNS 6581:2016, “Planning of information and telecommunication network in apartment buildings and its technical requirement” MNS 6580:2016, and “Detailed design of telecommunication cable lines” MNS 6305:2012.

(i) Based on satisfying the needs of information telecommunication planning of 2020–2030, the infrastructure planning is to create the four pipelines of new lining on main roads and depending on the loading, some area will have two pipelines of lining.
(ii) In between two manholes, distance will be less than 120 meters.
(iii) Depending on the loading of that area, there will be a two-store building has to be built for a storage of MHS’s service center and 25-30-meter-tall tower will be built at the same time and connect it to the ATC45 station in City of Ulaanbaatar.
(iv) There will be four pipelines of lining built in the Botanical Garden region area along with main road.
(v) Depending on the loading of that area, there will be a single-store building has to be built for a storage of MHS’s service center and connect it to the ATC45 station in the City of Ulaanbaatar.
(vi) It has been planned that new duct will sent out 96 lines of fiber optic from ATC 45 station to each information technology main centers.
(vii) The options of the information telecommunication’s advanced technology and equipment cannot be decided at this moment due to needs of customers. Thus, it is left for the private sectors. Urban planning of the manhole, duct, cables, lining and equipment selection can be solved in shop drawing stage.
(viii) Based on the customer’s needs, the planned main base communication network duct and lining can be used for bundle service of IPTV, portable network and internet for the family and offices. It will enable for customers to use the high-speed internet securely and network system will reach out without any obstacles.
(ix) Based on the customer needs, there are one or more operational companies can serve via the main service center building.

Figure 64. Telecommunication Planning Network of Tolgoit Subcenter

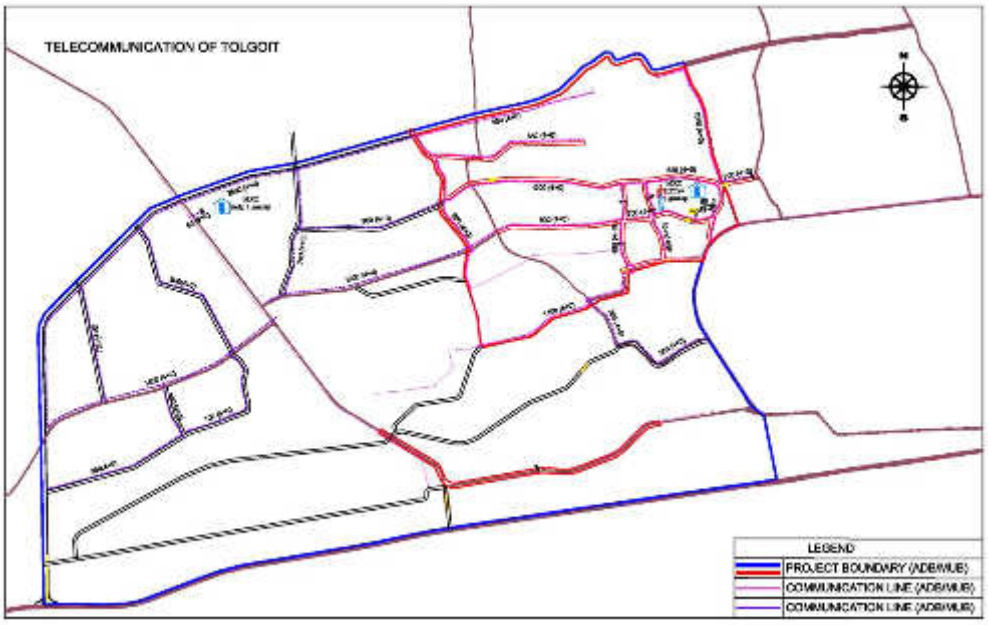


Table 61. Telecommunication Planning Network of Tolgoit Subcenter (Project Area)

No	Item	Type	Unit	Quantity
1	Telecommunication's service and data center /3-storied building/ -2 pcs	(25x12 m)	m^2	1008
2	Fiber optic cable	96 core	100 m	41.0
3	Primary duct (4+0), L5T type manhole /medium/	ф110 mm	100 m	87.0
5	Primary duct (9+0), M1 type manhole /large/	ф110 mm	100 m	0.5
6	25-30-meter-tall tower		25-30 m	1.0

Table 62. Telecommunication Planning Network of Tolgoit Subcenter (Subcenter Area)

No	Item	Type	Unit	Quantity
1	Telecommunication's service and data center /3 storied building/ -2 pcs	(25x12 m)	m^2	1,008

No	Item	Type	Unit	Quantity
2	Telecommunication's service and data center-/District/ 1 floor building	(6x12 m)	m^2	72
3	Fiber optic cable	96 core	100 m	81.0
4	Primary duct (4+0), L5T type manhole /medium/	ф110 mm	100 m	156.0
5	Primary duct (9+0), M1 type manhole /large/	ф110 mm	100 m	10.0
6	Tower		25-30 m	1.0

ii. Requirements for the design

(i) Layout (get the layout from Capital City Information Fund);
(ii) Integrate other infrastructure lines planning;
(iii) Implement in accordance with the approved technical condition and design work instruction;
(iv) Make the drawing legends in accordance with the Mongolian standards of MNS:6305:2012 and MNS:4908:2000;
(v) Consistent with the Mongolian standard of "Planning of information and telecommunication network in apartment buildings and its technical requirement" MNS 6580:2016; and
(vi) The size of pipes and their distance will be planned in consistence with Mongolian construction code of "Regulation for urban planning and construction" CCR 30-01-04.

294. The section drawings of the special areas, areas with steep slope or areas crossing under the road shall be made in details.

6. Primary health center at tolgoit

295. A primary health center with 50 beds is planned at Tolgoit subcenter. This facility will be a 3-storey building with 36 m x 17 m footprint. Together with its parking and green area, size of the total area occupied by the facility will be 1,044.3 m^2. The primary health center will offer basic health service to the residents of Tolgoit including vaccination, physical checking, preliminary diagnosis.

E. Associated and linked facilities

1. Associated facilities

296. Existing infrastructure facilities that are part of city wide network and projected to serve as the main distribution hub between the centralized networks of UB city and the planned water supply, sewerage, heating supply pipelines, power substations and telecommunications cables constructed by the project in Tranche 3 subcenters are summarized in Table below. In other words, the infrastructure facilities constructed by the project in the Tranche 3 subcenters can't operate without these associated facilities.

Table 63. Associated Facilities for Tranche 3

Fields of public utility	Associated Facilities		IEE section with detailed description	Operational entity
	Sharkhad subcenter	Tolgoit subcenter		
Water supply network	Existing water supply pipelines as D110, D160 mm with length of 9.0 km	Existing water pipelines with length of 12.9km and diameter of D110~250 mm	Chapter III, Section B-2	USUG (Water supply and distribution authority of Mongolia)
	Existing water reservoir storage capacity is 500 m^3	Tolgoit Reservoir (V = 1,000 m^3) under construction in 2019 by MUB		
	Existing pump station with 2 booster pumps and 1 circulating pump	Existing pump station in Tolgoit has 4 pumps with capacity of 900 to 1300 m^3 per day		
	8 existing water kiosks*	6 existing water kiosks*		
Sewerage network	Sharkhad area main collector of sewer with D400 and D800 mm installed at the south of outside of the project site	Tolgoit area main collector (D 500 mm) is installed at 800 m away from the border of the project site	Chapter III, Section B-3	
Heating supply network	Amgalan Heating plant, which is about 700 m away from the project subcenter	500 mm ~ 700 mm heating pipe network was already constructed spanning through to the northern part of the subcenter	Chapter III, Section B-4	Heating Distribution Network SOE (UBDN)
Power supply network	7 existing small substations with 10kV	Power substations of “Geo” and “RP-110” with total capacity of 100MW and 5 existing small substations with 10 kV	Chapter III, Section B-5	Power Distribution Network SOE
Tele-communication network	ATC-45 telecommunication station	ATC-63 telecommunication station	Chapter III, Section B-6	Communications and Information Technology Authority

*The existing water distribution kiosks within the subcenters will be connected to the water supply pipelines constructed by the project and will serve as water distributing point until secondary connections to individual households are completed. Thus, these kiosks can be regarded as associated facilities.

297. A detailed description of these existing associated facilities is provided in the Chapter III, Section B: Existing infrastructure at the subcenters. Detailed technical specifications, locations and photos are provided in the section.

2. Linked facilities

298. Infrastructure facilities that are integral parts of the city-wide centralized networks and designed to provide the whole Ulaanbaatar city with utility services are regarded as linked facilities. These include the main ground water wells and central pumping stations for the Ulaanbaatar city, central wastewater treatment plant of Ulaanbaatar city, Power Plants No.3 and No.4 and central landfill sites of the Ulaanbaatar city and medical waste handling facility of Element LLC at Narangiin Enger. All of these facilities are strategic sites controlled by the government. Brief description of each linked facility is provided in below paragraphs.

299. **The central water supply grid.** Water supply of Ulaanbaatar city relies on 5 main alluvial ground water deposits along the Tuul river basin. Detailed information and reserve estimations for the deposits are provided in section H – Groundwater resources in Chapter 4 of this report. Water supply deep wells at these deposits are connected the central water supply reservoir facility of Ulaanbaatar which locates in southeastern of the city. Water supply network pipelines distribute disinfected fresh water to all parts of the city. The nearest water supply pipeline to the Sharkhad subcenter is at the Military college which locates in 1km distance from the subcenter on its southwestern side. The nearest water supply pipeline to the Tolgoit subcenter traverses along the Orbit road on western side of the Tolgoit subcenter (in 800 m distance). All these government owner water supply facilities will be regarded as linked facility for the Tranche 3.

300. **The central wastewater treatment plant.** The central and only wastewater treatment plant of Ulaanbaatar city locates in Songinokhairkhan district in 3 km distance from the Tolgoit subcenter. It was built in 1964 with capacity estimation to serve 500,000 population. Since then, the city population has grown to 1.4 million as of 2018. Significantly overloaded capacity and outdated equipment led to operational deficiencies in recent year. Government of Mongolia is implementing a project to build a new Wastewater Treatment Plant of Ulaanbaatar city, which will locate adjacent to the current WWTP, with a loan worth USD300 million of the Government of China. Construction works of the new wastewater treatment plant has started in March 2019 and will be completed in 2022. By constructing the plant, it is expected to improve its quality and access, to secure environmental hygiene and safety as well as to make significant contribution to reduce air, soil and environmental pollution. This new wastewater treatment plant will be a linked facility for Tranche 3.

301. **The thermal power plants.** Heating and power supply in Ulaanbaatar city are provided by three main sources: Thermal Power Plant No.4, Thermal Power Plant No.3, and Amgalan Heating Plant. Thermal Power Plant No.4 (CHP4) is the main provider of central heating grid for the city and will be the main linked facility for Tolgoit subcenter. It locates in Bayangol district in western Ulaanbaatar in 3.5 km distance from the Tolgoit subcenter. CHP4 was built in 1983 and supplies about 55% of heating supply of Ulaanbaatar city. Its capacity is 700 MW. Amgalan Heating Plant was built in 2015 and is the main supplied of heating for eastern part of UB city. The plant has capacity of 348 MW and is located in 1.5 km distance from the Sharkhad subcenter. Both CHP4 and Amgalan heating plant will be linked facilities for the Tranche 3.

302. **The central landfill sites.** Inert materials, construction and domestic waste will be disposed to the landfill sites appointed by local district authorities. Thus, the central waste landfill sites (all government owned facilities) of Ulaanbaatar city could also be regarded as linked facilities for the Tranche 3. Ulaanbaatar city has three main waste landfill areas: Ulaanchuluut landfill, Tsagaan Davaa landfill, and Moringiin Enger landfill. Ulaanchuluur landfill site is located in 1.6 km distance from the Tolgoit subcenter and is expected to be the destination for inert materials and construction waste generated in Tolgoit subcenter. Tsagaan Davaa landfill area is located in 2.5 km distance from the Sharkhad subcenter and is expected to be the destination for inert materials and construction waste generated in Sharkhad subcenter. Waste management in Ulaanbaatar city has three levels: (i) households or entities will collect their waste in a designated place at their premise; (ii) each district has a waste transportation agency whose trucks collect the waste and transport to landfill sites; and (iii) each of the three landfill sites operate as a state-owned enterprise. They are responsible for receiving, diversifying and landfilling of the waste. And they have permanent on-site staffs and necessary machineries for landfilling. Before commencement of construction, the civil works contractors will have to sign waste disposal agreement with relevant district authorities to obtain necessary permission on waste disposal to the appointed landfill site. Based on approximate of location, Ulaanchuluut and Tsagaan Davaa landfill sites (both government owned sites) will be linked facilities for Tranche 3.

303. **The medical waste handling site.** Element LLC is the only licensed company by MOH to transport and handle medical waste in Ulaanbaatar city. Element LLC is contracted with all hospitals and PHC's in Ulaanbaatar city and responsible for transporting medical waste to their own designated landfill facility within the Narangiin Enger central dumpsite. Medical waste generated at the PHC in Tolgoit will be collected in a designated place before being transported to the above-mentioned medical waste handling site. Element LLC employs 55 staff and operates 10 specialized trucks and collects medical waste from every hospital 2–3 times a week. Their medical waste landfill facility at Narangiin Enger comprises of three buildings: office building, autoclave, and incineration building and material warehouse building. This facility is being run in PPP mode based on international model. [16]

304. The PMO must confirm from concerned authorities of various linked facilities on their ability to deliver required services and without interruptions The detailed design and supervision consultant under PMO shall do the due diligence from design stage to construction stage. Any underground utilities such as heating pipes, sewage drainage, water pipeline etc. if disconnected to the premises will be restored.

IV. DESCRIPTION OF ENVIRONMENT

A. Project location

305. The project has defined two boundaries i) ADB project areas (planned for investment under Tranche 3), ii) Subcenter area (bigger area to be developed by MUB later in phased manner). Figure 65 and Figure 66 show boundaries of for the ADB project areas and the subcenter areas.

306. This IEE study covers the bigger subcenter areas in order to illustrate baseline environmental and social conditions in more comprehensive and broader views, even though the proposed infrastructure development covers only ADB project areas.

307. Details of administrative division (district and khoroos) and location coordinates for the Tranche 3 subcenter areas are provided in Table 64 below.

Table 64. Location of Tranche 3 Subcenter Areas

№	Project areas	Location		
		City and district	Khoroo administration unit belongings	Coordination
1	Sharkhad	Ulaanbaatar city, Bayanzurkh district	Khoroos No.9,17,19,22 and 24	106^0 59' 59.72" E 47^0 55' 25.63" N
2	Tolgoit	Ulaanbaatar city, Songinokhairkhan district	Khoroos No.1,2,3 and 22	106^0 45' 12.63" E 47^0 55' 5.15" N

308. Brief description of the project areas are provided below.

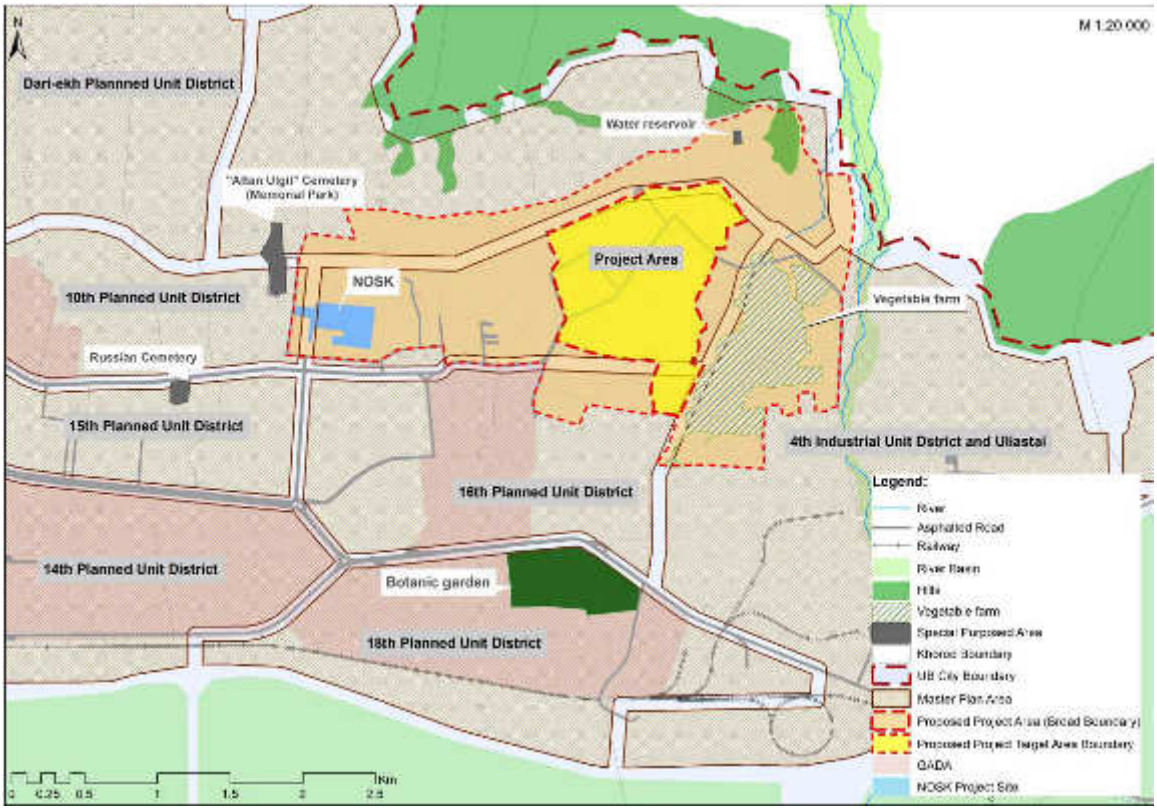
Sharkhad project area

309. Sharkhad subcenter located in the eastern part of Ulaanbaatar city. The ADB project area covers territories of Khoroos 9, 17 while the bigger subcenter area covers cover territories of khoroos 9, 17, 19, 22, and 24 in Bayanzurkh district. The ADB project area spreads over an area of 507 hectares, accommodating 8,939 population while the bigger subcenter area has 8,721 households with roughly

[16] The land belongs to UB Government while equipment etc belongs to Element LLC. It has collection facility and autoclave unit for disinfection. Aafter autoclave disinfection the staff disposes the waste using a land filling method which is scientific in nature.

31,395 residents. Within the Sharkhad subcenter, there is hospital, heat only boiler, school, bus stop and khoroo office. The economic activity in the subcenter is characterized by the automobile related commerce. There is a significant level of activity selling small truck/utilities and all supporting and ancillary activity. In below figure (Figure 65), the ADB project area is highlighted in yellow color while the bigger subcenter area is highlighted in brown color.

Figure 65. Sharkhad Project Area and Subcenter Boundary

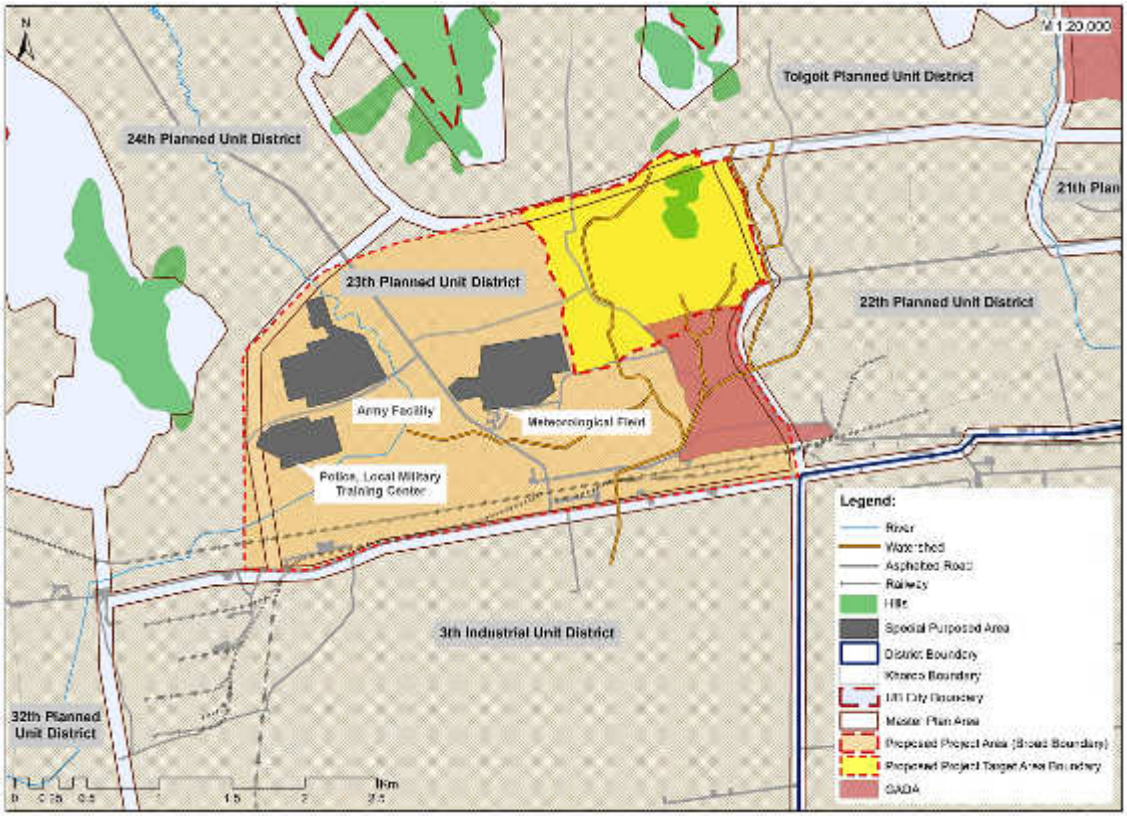


Tolgoit project area

310. Tolgoit subcenter is located in the western part of the Ulaanbaatar city covering territories of Khoroos 1, 2, 3, and 22 in Songinokhairkhan district. The subcenter area spreads over 737 hectares accommodating approximately 5,010 households with 18,505 persons, while the ADB project area covers territories of khoroos 1 and 2 [17] and has 1,846 households with 6,819 people. The Tolgoit subcenter area is constrained by typical problems of other ger areas, such as poorly planned settlement, underdeveloped road network and low residential densities. However, this area accommodates some public amenities and bus stops. The combination of topography and absent lateral roads means that traffic flow is directed or funneled predominately along north–south alignments toward the extension of Peace Avenue and then back again to enter the subcenters—causing congestion and limiting movement. There are no major industrial or commercial centers located in the vicinity of the Tolgoit subcenter. In below figure (Figure 66), the ADB project area is highlighted in yellow color while the bigger subcenter area is highlighted in brown color.

[17] Calculated by T2-CS02 consultancy team based on the information provided by district.

Figure 66. Tolgoit Project Area and Subcenter Boundary

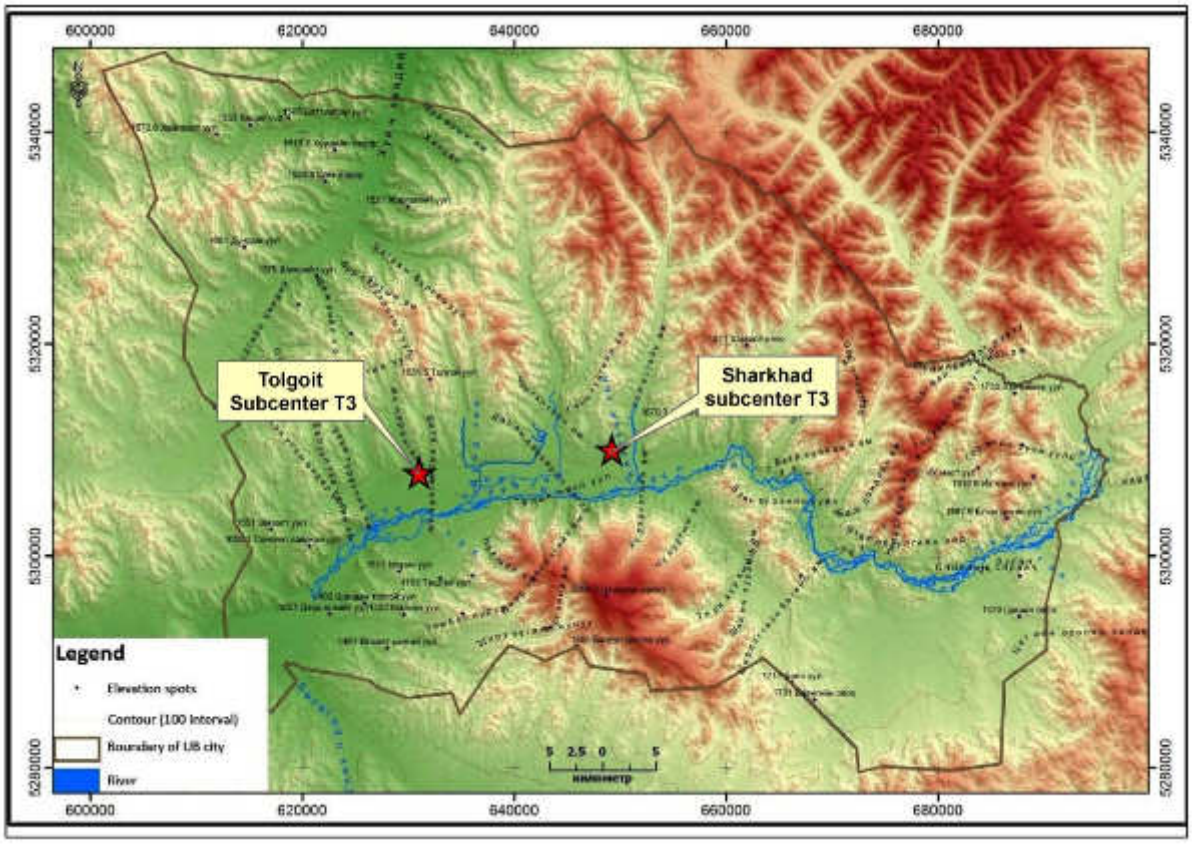


311. Following sections of this chapter provides baseline environmental descriptions for the subproject areas and locations.

B. Topography

312. By physical geographical divisions of Mongolia, Ulaanbaatar and its surrounding area is located in the southwestern edge of Khentii Mountain, in particular, the Tuul River flood plain and terrace, expanding up to 2.5–4 kilometers (km) in width. Geographically, it is in forest-steppe region which is surrounded by Bogdkhan, Songinokhairkhan, Chingeltei and Bayanzurkh Mountains, elevated 1950–2268 meters (m) above sea level.

Figure 67. Topographical Map of Ulaanbaatar City



313. Bogdkhan is a mountain chain that stretches 40 km from east to west. The highest peak is Tsetsee Gun, elevated 2,268 m above sea level. An ancient flat surface that is 2,000 m above sea level is dominant in the mountain.

314. Northwest of the city there are two major mountains, the 1,831 m high Tolgoit Mountain and 1,800 m high Chingeltei Mountain. The summit of the mountains are rounded and mountainsides lower gradually, turning to hills such as Maanit, Tasgany Ovoo, and Naran edging in the Tuul River valley.

315. There is tectonically originated Songinokhairkhan Mountain in the west whose absolute height is 1,652 m and Bayanzurkh Mountain in the east whose absolute height is 1,527 m. Those mountains have relatively steep sides, pointed tops and ravines. Difference of relative elevation of those mountains and valleys between the mountains is generally 400-500 m and sometimes reaches 700-920 m.

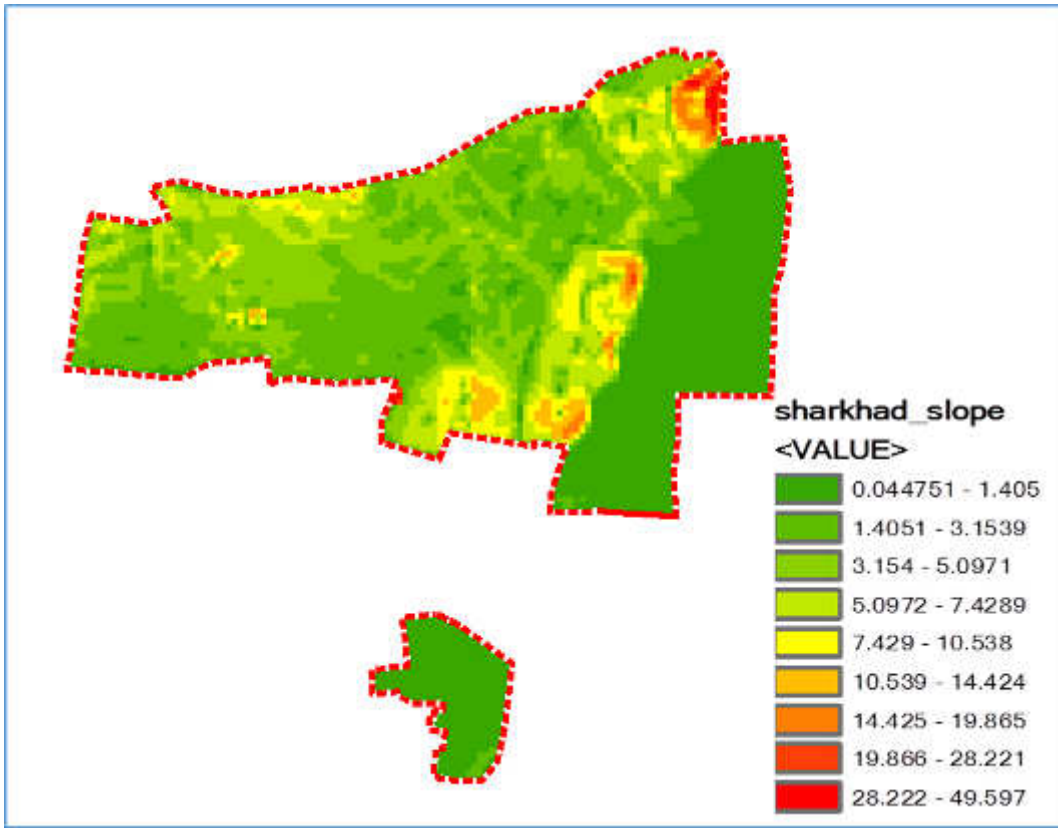
316. The elevation of the Tuul River Basin is 1250–1345 m and river width reaches 1.2–4.0 km. Absolute height of the small mountains such as Tolgoit, Bayankhoshuu, Bayantsogt, Khoid Bayan and Tsagduult is 1,515–1,831 m, while their sides or slope is usually 15-20 degrees and reach sometimes 30–35 degrees. A number of dry riverbeds and ravines are found crossing the sides and downhill of the mountains.

317. The majority of buildings in Ulaanbaatar were built in the Tuul River Basin, downstream area of Selbe River and terraces of Zuun Naran, Baruun Naran and Tsagaan Khuaran. State buildings or objects of special purpose are located within the protected zones of Ikh Tenger and Baga Tenger, in the southern edge of the Tuul River Valley. Additionally, there are small private housing complexes, summer houses

and ger districts in Selbe, Khul and Belkh River valleys, Khar Usan Tokhoi of Tuul River, Mogoin Denj, Ikh Khuandai, downstream of Uliastai and Gachuurt Rivers, and Zuun Salaa and Baruun Salaa of Tolgoit River.

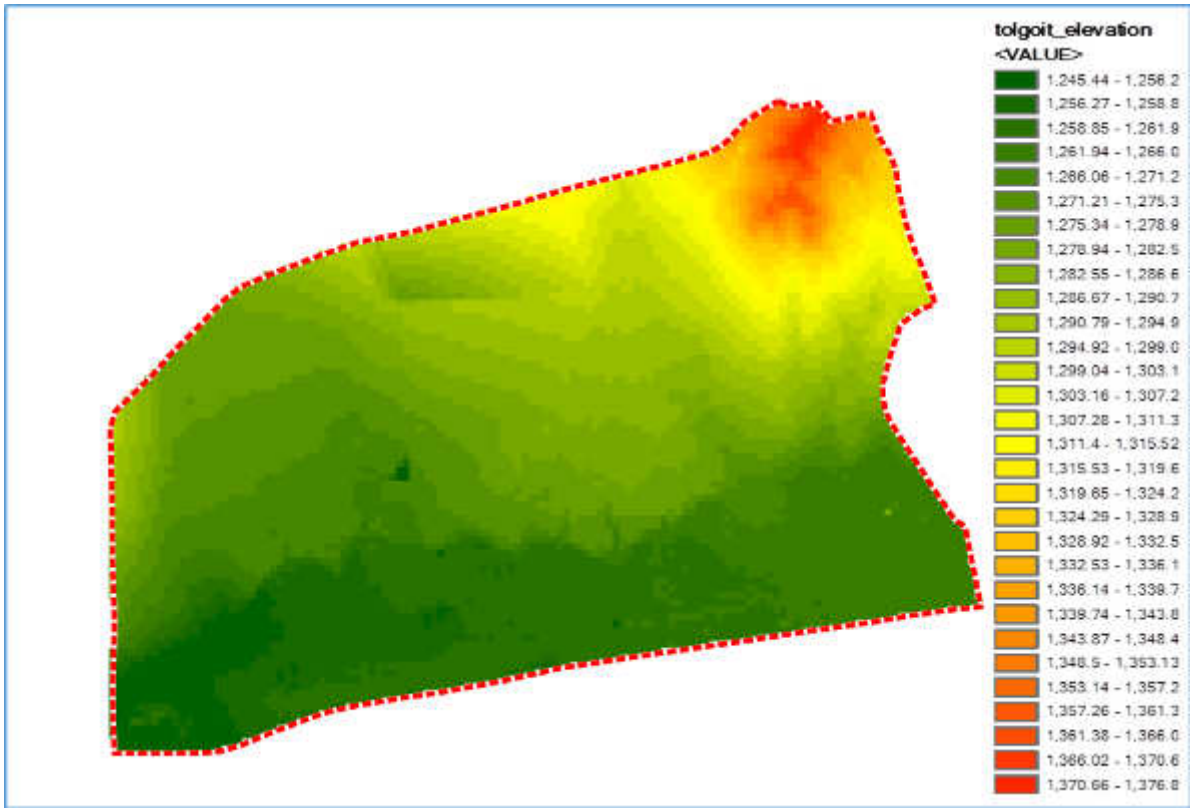
318. The Sharkhad subcenter is located on the small hills of Uliastai in northeastern Ulaanbaatar. Sharkhad topography varies from EL +1270 to EL + 1418 throughout the site and has limited flatland areas (refer to Figure 68). Northeastern corner and Southeastern part of the subcenter has three distinct small hills that create steep sloped terrain with 8-12%, which is not suitable for large scale development. As the slope is over 6 degrees thus requires significant environmental intervention if developed (refer to Figure 69). Because of the uneven terrain conditions, some areas of the site are prone to flooding. The north to south terrain is relatively even and suitable for development suitable.

Figure 68. Topographical Condition of Sharkhad Subcenter



319. The Tolgoit subcenters is located on the small hills at the mouth of the Bayangol valley in northwestern Ulaanbaatar. Tolgoit topography varies from EL +1245 to EL + 1376 from south to north following the mountain hills. Northern Tolgoit area has two small hills that create steep sloped terrain with 6–12%, which is not suitable for large scale development. Western part along with the central Tolgoit subcenter area has relatively flat land, which would be suitable for increased density and development. Areas in southern edge are prone to flooding. The topography of Tolgoit subcenter is shown below figure.

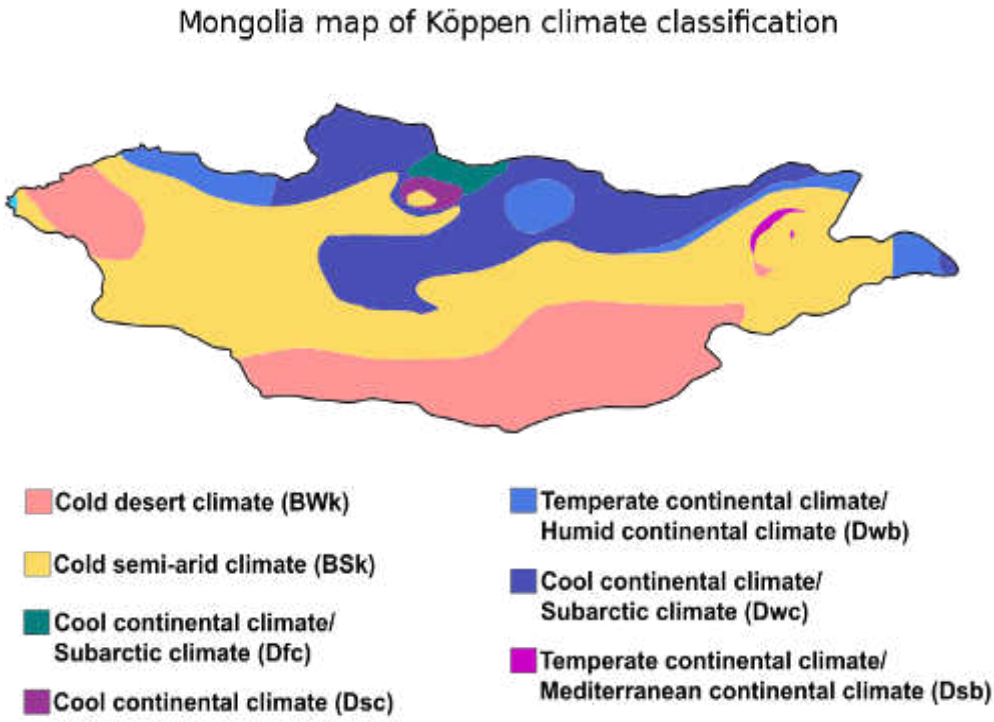
Figure 69. Topographical Condition of Tolgoit Subcenter



C. Climate condition

320. Both subcenters are located within the Ulaanbaatar city which has extreme continental climate and falls in the and semi-arid climate zone of the eastern Central Asia. In terms of Koppen Climate Classification system, Ulaanbaatar city falls in the cool continental/subarctic climate zone (Dwc). It has four seasons which comprises of short and warm summer (June to August), dry and cool autumn (September to October), long, harsh, cold winter (November to February), and dry and windy spring (March to May).

Figure 70. Koppen Climate Classification Map



1. Air temperature

321. Ulaanbaatar is the coldest capital city in the world where the air temperature in the winter reaches as low as -39.8^{0}C. The mean annual air temperature is 0.3^{0}C, while average temperature in January which is the coldest month of year is -21.5^{0}C. Monthly mean, maximum and minimum air temperatures for the last 15 years are shown in below tables.

Table 65. Monthly Mean Air Temperature in Ulaanbaatar City, 2003-2018, ^{0}C

Year	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	-20.6	-15.1	-7.5	3.1	9.5	17.0	18.8	14.2	10.3	0.3	-12.7	-21.2
2004	-21.3	-14.7	-10.0	4.4	9.6	18.0	19.0	16.3	9.8	1.5	-10.1	-17.2
2005	-22.0	-24.4	-8.2	1.9	9.0	16.1	20.5	18.3	9.9	2.6	-8.5	-19.4
2006	-20.4	-17.3	-6.3	-0.5	8.0	15.2	18.0	17.6	11.0	2.3	-8.4	-16.1
2007	-18.7	-10.7	-9.0	3.6	11.8	18.7	21.9	18.3	13.2	0.2	-9.0	-16.8
2008	-23.6	-17.7	-2.4	5.2	8.2	17.4	20.2	17.8	10.9	1.5	-7.1	-19.1
2009	-20.5	-17.3	-7.5	7.2	12.3	16.8	19.3	16.8	10.1	1.2	-13.5	-20.9
2010	-23.6	-20.8	-11.5	-2.2	12.1	19.4	21.7	15.6	12.2	1.6	-8.9	-19.2
2011	-23.8	-15.6	-9.6	4.2	8.2	17.3	17.4	18.4	8.0	3.7	-10.4	-22.1
2012	-25.5	-20.2	-8.0	2.7	11.5	15.2	18.0	15.9	11.6	0.2	-12.3	-22.4
2013	-20.8	-19.4	-6.3	0.2	11.6	15.8	17.9	15.5	9.3	1.0	-8.0	-15.9
2014	-18.5	-18.4	-4.7	6.9	8.2	15.4	17.9	16.3	9.9	3.7	-8.2	-16.6
2015	-15.6	-12.9	-6.2	4.1	9.0	16.7	19.9	18.8	10.7	2.9	-10.9	-15.7
2016	-23.9	-16.3	-4.7	3.5	9.1	15.6	20.7	17.6	10.6	-1.7	-13.7	-16.5
2017	-20.0	-13.7	-4.2	5.0	12.7	19.3	21.0	15.8	9.7	0.7	-12.2	-16.7
2018	-22.4	-17.7	-2.0	4.5	13.5	17.9	17.8	17.5	8.3	2.8	-8.8	-20.3

Table 66. Monthly Maximum Air Temperature in Ulaanbaatar City, 2010-2018, ^{0}C

Year	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	-6.2	-4.6	8.2	22.3	29.5	38.3	37.4	30.0	31.5	21.6	8.1	-3.0
2011	-9.6	2.0	12.6	24.4	27.2	32.5	30.0	33.0	25.2	22.0	10.5	-9.0
2012	-9.4	-4.3	14.4	22.4	30.0	32.7	29.4	31.4	27.4	19.0	9.6	-9.5
2013	-7.1	-2.5	9.6	19.5	28.7	29.0	30.0	27.4	26.5	20.2	9.1	-3.1
2014	-3.7	2.1	12.1	23.2	32.6	29.6	32.5	29.0	31.7	17.1	9.2	-6.3
2015	-3.6	2.7	17.5	26.7	28.3	31.1	33.7	33.7	27.3	20.2	10.3	-6.9
2016	-12.3	-1.2	12.7	18.7	28.0	29.4	34.6	36.7	22.8	18.8	6.7	-4.3
2017	-4.8	-0.8	13.1	23.1	31.4	34.5	36.9	29.0	26.1	17.7	9.4	-1.5
2018	-10.	-2.9	18.9	24.1	32.3	32.4	32.4	28.4	22.2	18.3	12.8	-1.9

Table 67. Monthly Minimum Air Temperature in Ulaanbaatar City, 2003-2018, ^{0}C

Year	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	-34.0	-31.5	-24.4	-10.9	-1.5	3.6	7.3	3.1	-0.3	-11.5	-24.9	-34.5
2004	-31.6	-28.0	-27.1	-14.9	-7.6	2.5	5.4	2.3	-7.4	-17.9	-24.6	-33.3
2005	-33.2	-35.0	-28.2	-14.0	-8.4	2.1	9.0	3.0	-3.3	-7.9	-17.4	-30.1
2006	-31.1	-36.9	-21.5	-15.8	-6.1	2.0	6.7	5.2	-3.2	-12.8	-25.7	-27.3
2007	-26.8	-22.6	-26.7	-12.6	-1.8	0.5	8.0	8.7	-3.4	-15.6	-20.9	-26.6
2008	-33.8	-31.6	-18.1	-10.2	-5.3	1.8	9.2	2.2	-3.6	-14.0	-20.0	-31.8
2009	-32.9	-33.3	-25.7	-8.1	-4.0	1.8	10.2	4.2	-4.4	-12.7	-25.5	-33.6
2010	-35.7	-33.1	-29.1	-17.0	-1.5	3.3	7.3	3.2	-5.3	-9.8	-23.9	-33.2
2013	-33.2	-29.9	-20.8	-14.8	-1.1	1.8	7.3	3.3	-4.2	-12.7	-21.4	-28.7
2014	-31.6	-29.5	-22.2	-8.1	-8.0	1.0	8.4	4.6	-8.8	-8.7	-23.8	-26.7
2015	-26.7	-24.8	-22.4	-16.7	-5.4	2.8	10.1	7.8	-2.6	-8.9	-30.2	-30.4
2016	-32.0	-26.8	-24.4	-8.9	-7.3	6.8	8.6	2.2	-4.1	-19.2	-31.5	-26.9
2017	-31.4	-25.6	-15.9	-8.2	-6.0	4.0	9.0	2.4	-6.1	-10.8	-26.7	-25.5
2018	-33.8	-28.3	-22.1	-14.1	-3.7	4.4	2.7	8.4	-2.6	-10.6	-22.3	-31.1

2. Precipitation

322. In terms of precipitation, Ulaanbaatar city belongs to the Arctic ocean watershed. The annual precipitation level in the city is about 262 mm. Average annual moisture level is around 0.36% with highest moisture level (75–80%) occurring in January and lowest in May (45–50%). 87% of the total precipitation which equals to 180 mm falls during the summer season between June and August. It has snow cover for about 130 days a year (multi-year average) between November 10 and March 20. Below table shows the monthly precipitation level recorded during the last 15 years between 2003 and 2017.

Table 68. Monthly Precipitation Level in Ulaanbaatar City, 2003-2017, mm

Year	Monthly precipitation level, mm												Yearly total, mm
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2003	1.4	6.2	1.3	3.3	51.4	22.3	75.3	46.3	51.6	2.9	19.2	6.8	288.0
2004	2.3	8.9	7	16.5	25.6	85.8	48.6	16.8	34.6	3.5	5.6	5.5	260.7
2005	4.4	4.6	4.8	10.5	13.6	24.4	59.9	41.8	23.9	1.5	1.7	2.2	192.8
2006	5.1	1.1	3.5	5.6	70.1	26.3	86.4	26.2	18.4	10.2	3.1	1.8	273.4
2007	4.4	6.7	11.5	4.5	18.6	23.2	35.5	72.6	0.8	1.8	2.1	4	185.7
2008	2.2	0.9	2.3	1.4	12.4	67.2	69.1	41.3	14	10.8	0.7	6.2	229.6
2009	0.9	2.8	3.8	2	39	31.1	118	47.3	13.8	8.1	1.8	5.5	272.1
2010	2.3	4.4	7.2	1.1	25.7	23.3	79.6	65.8	8.9	12.6	7.6	1.2	239.1
2011	1.4	8.2	0.4	11	27.4	77.3	58.3	43.9	7.6	10.5	11.7	2.1	259.6
2012	0.7	1.4	0.9	6.5	9	70.1	106.8	56.7	17.5	3.8	7.8	6.2	288.0

Year	Monthly precipitation level, mm												Yearly total, mm
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2013	1.4	1.8	11.2	13.6	26.8	36.8	37.2	75.4	15.8	34.5	3.8	1.4	259.8
2014	0.9	1.9	2	6.8	40	62.4	100.4	55.2	19.1	1.5	0.9	3.1	294.8
2015	1.3	0.8	20.5	22.6	12.7	9.2	125.5	30.8	22.6	14.2	5.1	4.5	270.0
2016	1.2	1.4	10.9	3.2	33.2	68.4	80.5	45.2	24.5	13.7	18.4	1.1	301.7
2017	0.8	0.2	1.9	2.6	11	70.4	28.1	94.6	48.1	16.1	11.2	2.4	192.8
2018	1.8	3.2	0.6	11.2			128.5	92.9	65.4	7.3	1.1	1.0	313.0

3. Wind regime

323. The predominant wind directions in Ulaanbaatar city are north-to-south and northwest to southeast. Average annual wind speed is 2.2 m/sec. Wind speed is at its lowest during the winter season due to anti-cyclone centered in western Mongolia while during the spring, the most windy season of year, it reaches up to 15-20 m/sec in April and May. Below tables show monthly average and maximum wind speed recorded during the last 15 years between 2003 and 2017.

Table 69. Monthly Average Wind Speed, m/sec

Year	Monthly average wind speed, m/sec											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	0.9	1.4	1.6	2.3	2.4	2.3	1.9	2.1	1.8	1.2	1.3	0.6
2004	0.9	1.2	1.8	2.1	2.5	2.3	2.0	1.7	2.0	1.3	1.3	1.0
2005	1.1	1.0	1.9	3.3	3.4	2.9	2.9	2.7	2.8	2.4	1.8	1.5
2006	1.0	1.5	2.0	2.7	2.5	2.0	1.5	2.4	2.2	2.2	1.3	1.0
2007	0.9	1.3	1.5	2.3	2.7	2.7	2.1	2.1	2.0	1.7	1.3	0.8
2008	0.9	1.1	2.0	3.1	3.3	3.1	2.9	2.8	2.8	2.5	1.9	1.6
2009	1.4	2.2	2.6	3.0	3.5	3.5	3.1	2.9	3.0	2.4	1.8	1.8
2010	1.9	2.1	2.8	2.9	3.6	3.2	3.1	2.8	2.7	2.1	1.9	1.7
2011	1.3	1.7	2.3	3.1	3.2	3.0	2.8	2.7	2.6	2.2	2.0	1.2
2012	1.1	1.8	2.4	3.2	3.4	2.7	2.2	2.8	2.5	2.2	2.1	1.6
2013	1.2	1.6	2.4	2.6	3.2	3.1	2.1	2.3	2.5	2.3	1.4	1.0
2014	1.3	1.7	2.3	2.7	3.0	2.9	2.6	2.7	2.5	2.0	1.7	0.8
2015	1.0	1.2	1.6	2.2	2.7	2.2	2.3	2.0	2.0	1.6	1.2	0.6
2016	0.6	0.9	1.2	2.1	2.2	1.7	2.4	2.2	2.1	2.2	1.6	0.9
2017	1.2	1.5	1.8	2.2	2.8	2.3	1.5	2.1	2.5	1.7	1.3	1.0
2018	0.7	0.9	1.1	1.4	1.7	2.1	2.4	2.3	2.6	2.2	1.8	1.3

Table 70. Monthly Maximum Wind Speed, m/sec

Year	Monthly max wind speed, m/sec											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	20	12	12	16	20	14	12	12	16	16	18	12
2004	12	14	16	18	16	16	14	14	14	10	10	12
2005	10	12	12	24	21	20	22	24	21	17	14	10
2006	5	12	14	20	20	17	20	20	21	18	17	10
2007	15	12	17	14	14	18	17	18	16	13	10	9
2008	7	8	14	21	20	30	21	24	16	16	14	17
2009	14	19	18	20	19	21	20	17	20	16	15	18
2010	13	22	19	19	22	25	17	22	14	14	20	13
2011	10	11	20	19	23	20	18	18	19	16	13	9
2012	10	13	17	20	19	20	17	20	20	14	13	13
2013	12	14	18	15	22	18	15	15	16	19	14	15
2014	12	12	18	24	19	23	22	20	21	17	17	12
2015	12.0	14.0	14.0	20.0	19.0	19.0	21.0	22.0	18.0	19.0	13.0	12.0
2016	11.0	14.0	20.0	18.0	21.0	15.0	20.0	14.0	13.0	23.0	12.0	11.0

Year	Monthly max wind speed, m/sec											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	16.0	14.0	12.0	16.0	20.0	23.0	18.0	20.0	14.0	16.0	14.0	10.0
2018	10.0	17.0	17.0	19.0			15.0	14.0	18.0	15.0	15.0	13.0

D. Air quality

324. Air pollution in Mongolia is severe. Air pollution in the capital Ulaanbaatar surpasses standard levels with the adverse effect on the population's health and well-being as well as environmental balance. A World Bank study states that particulate matter is the largest and relatively most severe air pollution problem in the City. In terms of particulate matter, Ulaanbaatar is ''among the most polluted cities in the world. Primary sources of air pollution in Ulaanbaatar are three thermal power plants, about 200 small and medium sized heating boilers, about 200,000 traditional gers and wooden houses, and over 40,000 automobiles. Topography and meteorology exacerbated ambient air quality conditions in the country, and particularly in Ulaanbaatar. Mountains surround Ulaanbaatar up to 2,250 meters in height inhibited dispersion of pollutants. To compound the situation, a stable atmospheric inversion forms during the winter season. As a result, ambient pollutant concentrations often remained for days or weeks at a time to exceed Mongolian and other international ambient air quality standards. Burning of coal and woods in the households in urban cities has been identified as major sources of air pollution, which affects ambient air quality and human health.

325. The Sharkhad and Tolgoit subcenters are both located in the midst of ger area of Ulaanbaatar where the air pollution is highest during the winter period. Based on the air quality measurement data obtained from the air quality stations in the Ulaanbaatar city, concentrates of the key air pollution parameters such as SO_2 , NO_2 , and dust are described in following sections.

1. Sulphur dioxide (SO_2)

326. Looking at the measurement results of 2018, average monthly value of the sulphur dioxide has exceeded both national and international standards during the winter months.

Table 71. Monthly Average Values of Sulphur Dioxide, mg/m^3

Months	Sharkhad subcenter	Tolgoit subcenter	Requirement of national standard MNS 4585:2016	EHS Guidelines. World Health Organization - Air Quality Guidelines Global Update 2005)
	2018	2018		
January	71	-	20 µg/m^3 (1 year average)	20 µg/m^3 (guideline)
February	-	89		
March	11	35		
April	7	21		
May	5	7		
June	3	6		
July	3	1		
August	3	3		
September	4	6		
October	7	25		
November	21	53		
December	31	104		

2. Nitrogen dioxide, NO_2

327. All of the measured monthly average values of nitrogen dioxide of 2018, average monthly value of the nitrogen dioxide has exceeded both national and international standards during the winter months.

Table 72. Monthly Average Values of Nitrogen Dioxide, mg/m^3

Months	Sharkhad subcenter 2018	Tolgoit subcenter 2018	Requirement of national standard MNS 4585:2016	EHS Guidelines. World Health Organization - Air Quality Guidelines Global Update 2005)
January	56	60	40 µg/m^3 (1 year average)	40 µg/m^3 (guideline)
February	51	50		
March	29	23		
April	25	20		
May	21	15		
June	18	12		
July	16	14		
August	16	13		
September	19	18		
October	28	33		
November	36	41		
December	43	66		

3. Dust concentration, particulate matter 10

328. The monthly average level of dust concentration particulate matter 10 has exceeded the standard level of 0.05 mg/m^3 specified in national standard MNS 4585:2016 in nearly every month of 2018.

Table 73. Monthly Average Dust Concentration Level Particulate Matter 10, mg/m^3

Months	Sharkhad subcenter 2018	Tolgoit subcenter 2018	Requirement of national standard MNS 4585:2016	EHS Guidelines. World Health Organization - Air Quality Guidelines Global Update 2005)
January	164	240	50 µg/m^3 (1 year average)	50 µg/m^3 (guideline)
February	157	105		
March	143	34		
April	118	78		
May	139	83		
June	75	48		
July	41	11		
August	58	26		
September	68	60		
October	122	135		
November	192	191		
December	177	154		

4. Dust concentration level, particulate matter 2.5

329. The monthly average level of dust concentration particulate matter 2.5 has exceeded the standard level of 0.025 mg/m^3 specified in national standard MNS 4,585:2016 in nearly every month of 2018.

Table 74. Monthly Average Dust Concentration Level Particulate Matter 2.5, mg/m^3

Months	Sharkhad subcenter	Tolgoit subcenter	Requirement of national standard MNS 4585:2016	EHS Guidelines. World Health Organization - Air Quality Guidelines Global Update 2005)
	2018	2018		
January	139	232	25 µg/m^3 (1 year average)	10 µg/m^3 (1 year average)
February	126	102		
March	58	30		
April	28	33		
May	23	24		
June	17	14		
July	15	4		
August	18	10		
September	23	24		
October	38	76		
November	83	125		
December	121	137		

E. Noise

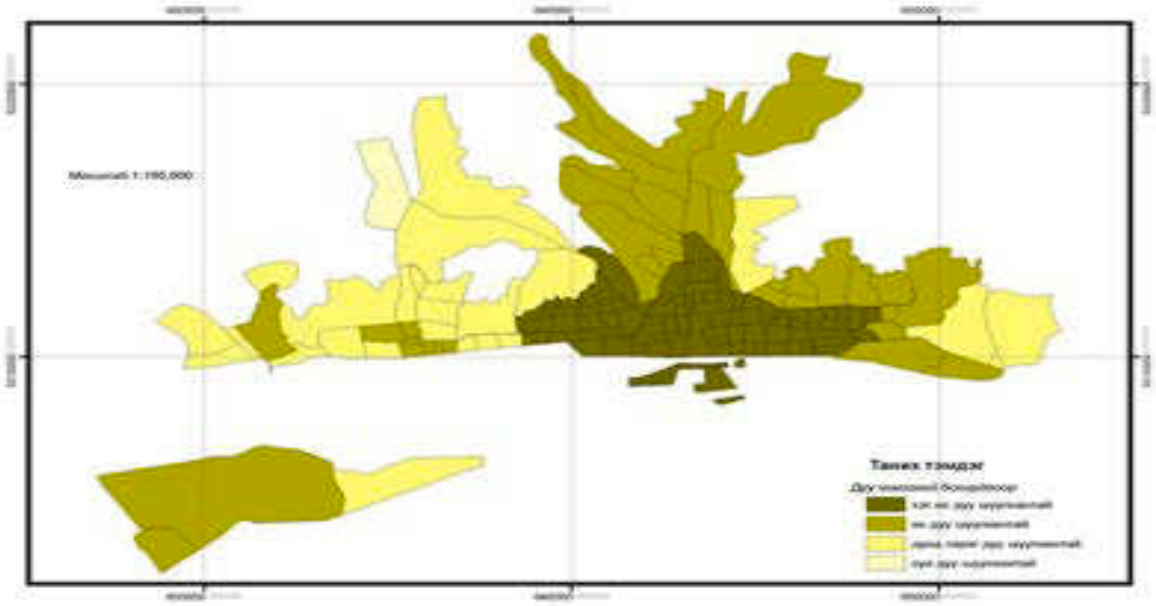
330. WHO states that guidelines on community noise (not industrial workplace noise, therefore including traffic) should be based on the following:

(i) **Indoor sound levels**, thresholds for guidelines should be based on a combination of values of 30 dB (average equivalent over 8 hours LAeq) and 45 dB (maximum for an individual noise event); and

(ii) **Outdoor sound levels** should not exceed 50 dB LAeq to protect the majority of people from being moderately annoyed during the daytime. Most countries in Europe have adopted 40 dB LAeq as the maximum allowable level for new developments;

331. It is clear from the noise measurements in Ulaanbaatar that in the majority of locations, ambient noise exceeds the WHO recommendations for community noise outside. However, with regards to the noise within sensitive receptors such as households, the data are of limited value as the distance from the source is not given and measurements are not taken within buildings. Noise pollution estimation of Ulaanbaatar city has been done according to the complex assessment of urban development in 2016 (Figure 71).

Figure 71. Noise Pollution Estimation of Ulaanbaatar City



Source: Journal published by Eurasian Union of Scientists, “International Conference on Science and Practice”.

332. According to the research work done by Eurasian Union of Scientists, construction area of the center of Ulaanbaatar city has extreme noise, 41.8 percent of all settled area has too much or great noise, 36.9 percent has an average noise and 21.3 percent has low estimation. Moreover, there is an estimation that it was 81.5–85.9 db (A) or unsuitable in the distance up to 300 m from the railway, 68.55–72.6 db (A) or limited suitable in the distance of 300–500 m, 56.3 db (A) or suitable in 500–600 m distance.

333. But, it has been estimated that 64 db (A) or limited suitable was in the distance up to 100 m from the central highway of the city and 45.7-58.3 db (A) or suitable was in 100–500 m distance.

334. As described in the urban planning and construction norm, it has been determined that settled zone will be planned in the distance not less than 100 m from railway and further, it is required to plan to be in distance not less than 300 m from railway and 100 m from highway.

335. Noise measurements were made by the Central Laboratory of MNET at 14 locations using mobile equipment. Ambient noise levels throughout the city center are consistent with little fluctuations (Table 75). Average noise levels comply with Mongolian standards (the Standard of Mongolia. Sorting code 13.100. Occupational safety and hygiene. General requirement for the measurement of noise. MNS 5003–2000), but periodically exceed the standards especially along transport corridors, as traffic is a major source of noise in the urban area along with construction noise. These data are further supported by monitoring for a domestic EIA report which observed noise levels in the City at 62 dB at the curbside in peak hour traffic, dropping slightly to 61 dB at the wall of the closest building at ground level. This figure reduces to 59 dB at 4 meters above ground.

336. Below table shows results of noise measurement carried out at the subcenters on May 02, 2019.

Table 75. Noise Measurements Results

No.	Measurement location	Duration	Measured noise level /decibel/	National standard
1	Nearby main public road in Sharkhad subcenter	1 hour average	53.7	50.0
2	Ger area road in Tolgoit subcenter	1 hour average	31.8	

Source: Environmental Consultant, 2019.

F. Soil, geology, and seismology

1. Soil

337. Ulaanbaatar city is located within the Khentii mountain range and Tuul river basin and in steppe-forest natural zone. In terms of soil-geographical zonation system of Mongolia, Ulaanbaatar city belongs to the mountain dark brown soil zone. The main types of soil distributed within the Ulaanbaatar city are alluvial dark brown soil and grassland dark brown soil.

338. In terms of geological age, following soil types were identified in Ulaanbaatar and its surrounding area:

(i) Techno genic topsoil;
(ii) Contemporary pluvial gravel soil;
(iii) Contemporary alluvial soil;
(iv) Contemporary diluvial-proluvial upper soil;
(v) Middle-upper quaternary alluvial-pluvial soil;
(vi) Eluvial-diluvual gravel soil;
(vii) Neógeno lacustrine-alluvial-proluvial clay soil; and
(viii) Carbonaceous sedimentary rock soil.

339. Soil pollution has become a serious issue in Ulaanbaatar city in recent years. Especially in ger areas, the soil polluted due to pit latrines and improper waste disposals. Specialized Inspection Agency of Ulaanbaatar city conducts soil tests twice a year in densely populated areas. According to the lab test results of the survey in 2017, 32 percent of Ulaanbaatar has been affected by soil contamination.

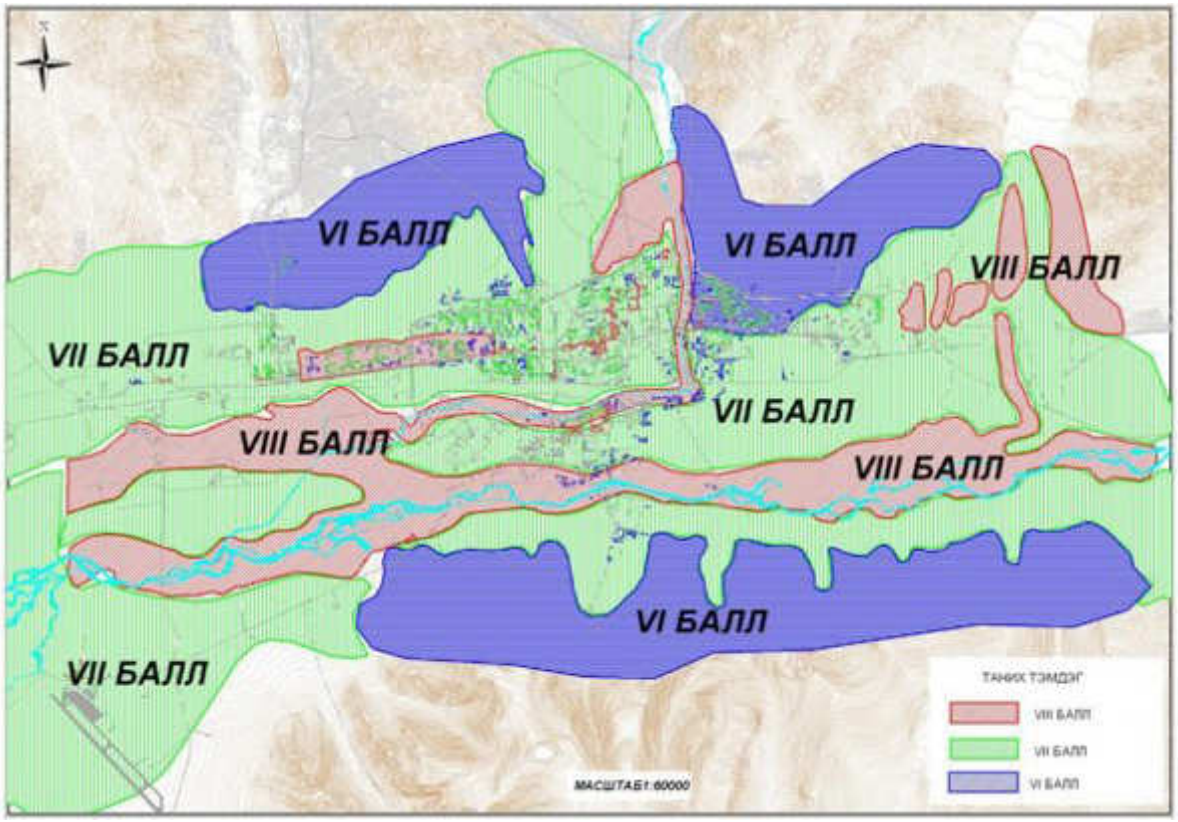
2. Geology

340. Geologically the Ulaanbaatar region belongs to the Khentii geosynclinals depression. Ulaanbaatar City is mainly underlain by Cambrian, Devonian, and Carboniferous sandstone and mudstone. Ulaanbaatar City is located on an alluvial plain. MNET confirmed that in the City, soil is low in permeability and gullying and erosion is visible on steep slopes in the *Ger* areas to the North of the City.

3. Seismology

341. Territory of Ulaanbaatar city falls within the earthquake magnitude scale ranges between 6.0 and 8.0 degrees in Mercalli scale. According to the recent study of faults in Bogd and Bulnai, big faults move in a frequency of thousands of years and velocity of their transition changes by very few millimeters per joule. Small faults are of medium strength (Magnitude 6-7); frequency of quake may be longer (Ochirbat Fund).

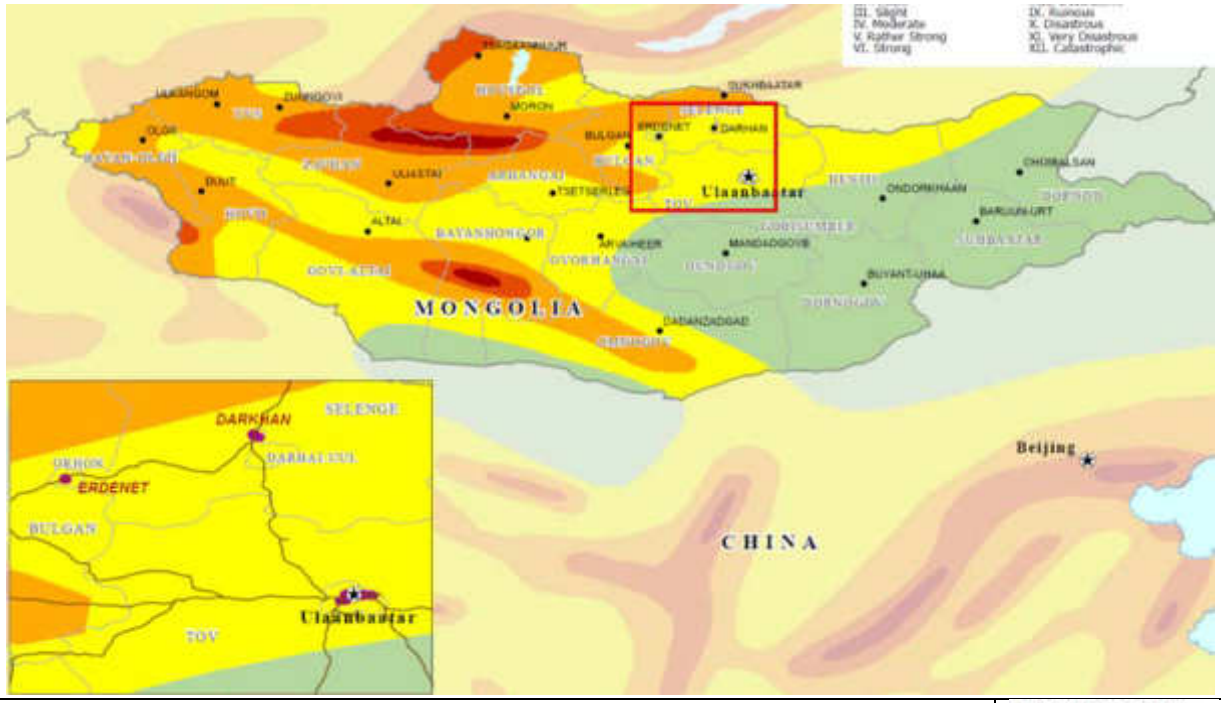
Figure 72. Earthquake Zonation Map of Ulaanbaatar



342. Figure 73 illustrates seismic hazard in terms of macro-seismic intensity, using the Modified Mercalli Scale which is an alternative hazard metric to the older peak ground acceleration measure. Intensity is a generic bounded damage scale used to relate observed (or expected/forecasted) damage to the earth and built environment directly to earthquake magnitude. Macro-seismic intensity is a subjective scale requiring a personal interpretation of damage experienced by buildings after an earthquake, and is largely based on post-earthquake field surveys of building and site damage.

Figure 73. Earthquake Risk: Modified Mercalli Scale (Mongolia)

Created 17 August 2010

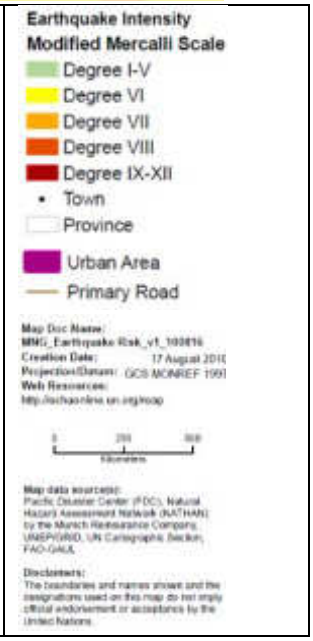


Earthquake Intensity Risk Zones

This map shows earthquake intensity zones in accordance with the 1956 version of the Modified Mercalli Scale (MM), describing the effects of an earthquake on the surface of the earth and integrating numerous parameters such as ground acceleration, duration of an earthquake, and subsoil effects. It also includes historical earthquake reports. The Zones indicate where there is a probability of 20 percent that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods.

I. Instrumental	VII. Very Strong
II. Feeble	VIII. Destructive
III. Slight	IX. Ruinous
IV. Moderate	X. Disastrous
V. Rather Strong	XI. Very Disastrous
VI. Strong	XII. Catastrophic

OCHA Regional Office for Asia Pacific



Source: http://www.preventionweb.net/files/15692_mngearthquakeriskv1100816.pdf.

G. Surface water resources and quality

1. Surface water in the project area

343. There are no surface water bodies in the vicinity of the Tolgoit subcenter.

344. The closest surface water body to the Sharkhad subcenter is Uliastai river which flows in 580m distance on eastern side. Uliastai is a small river with flow rate less than 1 m/sec. Also, there is a marshland area on locates adjacent to the Sharkhad subcenter on its east side.

Figure 74. Surface Water Bodies Around the Sharkhad Subcenter

2. Surface water in the Ulaanbaatar area

345. Ulaanbaatar city is located in the Tuul River basin. The Tuul River is 704 km long and drains an area 49,840 square km. The width of the Tuul River is 35–75 meters in normal situation, depth 0.8–3.5 m and water flow is 0.50–1.50 m/sec. One of the specific peculiarities of the runoff source of the Tuul River is the relatively low portion of groundwater contribution. It was estimated that about 69% of the annual runoff forms from rainfall, 6% from snow melting and 25% from groundwater source. This indicates that according to the flow regime classification the Tuul River belongs to the rivers with spring snow melting and rainfall floods.

346. Water levels are very unstable during the warm season because the main factors contributing to river runoff are summer rainfall. There is observed spring floods at the end of April and early May, but the duration and runoff will be less than rainfall. After the spring flood a short warm season low flow is observed. During July to September the rainfall flood is observed with several flow peaks. The maximum discharge of the rainfall flood exceeds the spring flood amount by 1.5–2 times. After the rainfall flood, the water level recedes until the beginning of the ice phenomena. The river ice phenomena begins

from the last 10 days of October and it is fully glaciated from the 2nd 10 days of November until end of the April with an average of 149 days.

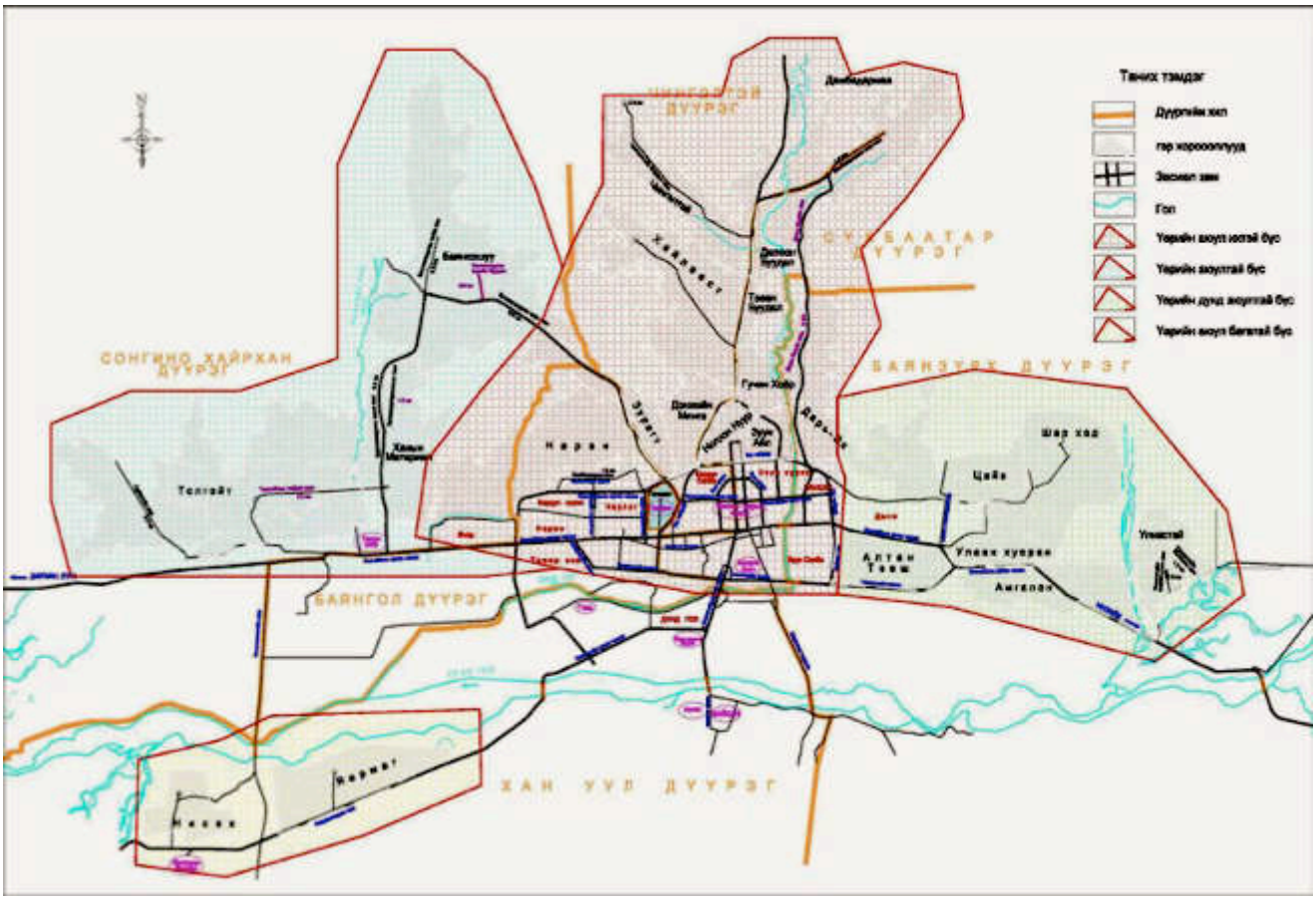
Table 76. The Long Term Mean Runoff for the Tuul River

	Months											
Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2001	0.00	0.00	0.58	4.55	44.99	26.48	26.18	42.50	31.19	13.57	2.54	0.18
2002	0.00	0.00	0.15	0.87	34.97	23.93	40.60	13.10	11.33	7.33	1.34	0.04
2003	0.00	0.00	0.03	2.66	28.60	16.90	32.40	41.70	22.60	8.95	2.05	0.35
2004	0.00	0.00	0.07	13.56	24.82	18.07	44.59	25.51	23.76	18.35	4.92	0.52
2005	0.00	0.00	0.02	3.70	14.75	52.05	22.80	25.64	31.42	17.82	2.72	0.05
2006	0.00	0.00	0.14	3.66	20.33	48.45	48.10	18.71	11.10	8.65	1.65	0.08
2007	0.00	0.00	0.16	2.25	15.40	10.50	26.20	25.30	17.70	9.32	0.94	0.03
2008	0.00	0.00	0.04	1.97	3.62	38.30	78.90	20.10	38.10	15.50	4.44	0.33
2009	0.01	0.00	0.13	8.68	11.22	23.24	44.58	33.66	21.36	10.45	1.58	0.31
2010	0.01	0.00	0.00	1.67	22.30	14.00	11.30	24.50	12.40	6.53	1.50	0.02
2011	0.00	0.00	0.00	3.96	31.00	33.50	40.85	16.39	11.28	6.45	2.00	0.13
2012	0.00	0.00	0.00	0.72	23.80	26.00	77.60	71.50	38.70	17.50	3.52	0.27
2013	0.00	0.00	0.00	1.96	12.10	34.60	49.30	80.20	54.50	16.00	3.44	0.36
2014	0.01	0.00	0.01	2.21	41.00	41.70	91.30	36.90	19.70	11.20	3.25	0.69
2015	0.06	0.00	0.13	12.00	7.61	8.06	12.50	30.40	13.50	8.72	2.48	0.39

3. Flooding

347. Localized flooding can be caused in most areas of the country, especially in built-up areas through heavy rain events because of poor surface water drainage. This flooding is ephemeral and the water subsides rapidly. More than 75% of precipitation in Ulaanbaatar occurs in July and August. Serious floods, mainly caused by the Tuul River, occurred in 1915, 1939, 1959, 1966, 1967, 1971, 1973, 1982, and 2003. In 1966, the Tuul water level reached 3.2 meters with a flow of 1500–1800 cubic meters per second and the flood killed over 100 people. As shown in below map, both subcenters are located in areas where flood risk is moderate.

Figure 75. Flood Prone Areas of Ulaanbaatar

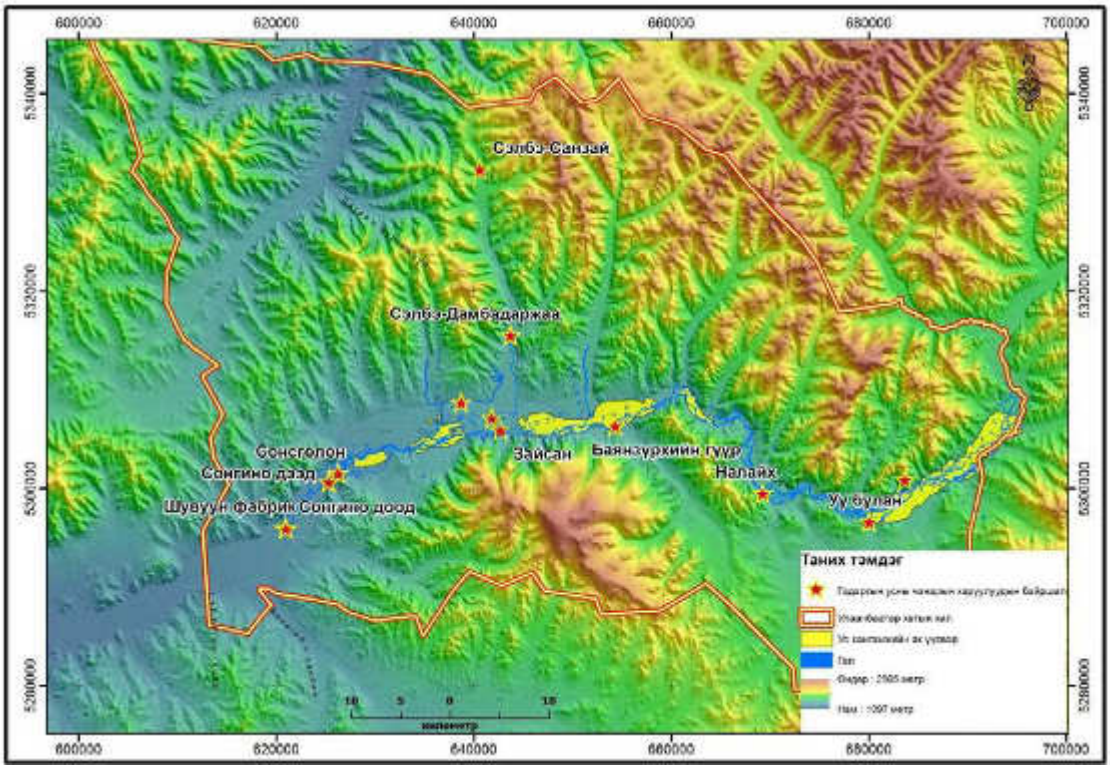


Source: Emergency Management Department of Ulaanbaatar Municipality

4. Surface water quality

348. There is a total of 13 water quality hydrological gauging stations operating in Ulaanbaatar.

Figure 76. Surface Water Quality Hydrological Gauging Stations in Ulaanbaatar



349. In determining the water quality and composition of the Tuul and its tributaries, data of June 2013–2017 provided by the Central Environmental Laboratory of the Institute of Meteorology and Hydrology was used for presenting a long-term average rate. The Institute of Meteorology and Hydrology also summarizes he results of the water quality monitoring reports and assesses the water pollution index at each monitoring point. Data of The Tuul and its tributary rivers, and the monitoring results for drinking water quality and safety for the capital city and the soums carried out by the General Agency for Specialized Inspection.

Table 77. Average Water Quality in the Tuul river in Ulaanbaatar City (1998–2008)

Summary	DO [mg/l]	BOD5 [mg/l]	COD [mg/l]	NH4+ [mg/l]	NO2- [mg/l]	NO3- [mg/l]	PO4-3 [mg/l]
Mean	8.68	4.59	5.42	1.47	0.060	0.65	0.12
Min	6.87	1.79	2.96	0.11	0.003	0.15	0.01
Max	9.40	15.79	9.34	6.47	0.220	1.77	0.50
Standard	0.81	4.37	2.22	2.18	0.079	0.51	0.17

Source: Data from analyzing by Environmental monitoring laboratory of MNET, in Ulaanbaatar city, 1998–2008.

350. The result of heavy metals analysis of the samples taken by SEC LLC in August 2017 is shown in Table 78. The table shows that there is no indication of surface water exceeded second grade of the Surface Water Quality Standard (SWQS) which was classified as clean. Most of the heavy metals tend to increase along the downstream.

Table 78. The Heavy Metal Content of Water of the Tuul River

№	Laboratory No.	Samples	Content mg/l					
			Ni	Cd	Pb	Zn	Cr	Cu
3	3235	Tuul/Zaisan	0.00	0.00	0.00	0.67	0.00	0.16
Requirements of national standard			0.01	0.005	0.01	0.01	0.05	0.01

H. Groundwater resources and quality

1. Hydrogeological structure

351. Groundwater exists in unconfined aquifers (alluvial sediments of late quaternary to recent period) at depths between 4–30 m. The static water level in the Tuul River valley is from 2–6 m in winter and 0.5–5 m in summer, if there are no wells in operation. However, extraction of groundwater can cause the static water level to drop from 10–13 m in winter and from 15–19 m in summer.

352. There were spread two main types of aquifers of porous water bearing complex and fractures zone within the Tuul river basin and there can be found springs or spas (Ulaanbaatar, Ar Janchivlin, Ovor Janchivlin, etc.) containing natural carbon dioxide gas in the porous and fracture water. The porous water bearing complex contained in the lower Cretaceous, Neogene and quaternary deposits, however the fractured zone was found in the intrusive rocks of Cambrium, Devonium, Jurassic and Triassic periods and in the sedimentary and metamorphic deposits of Carbonic period.

353. Geological ages and lithological compositions of the aquifers found in the Tuul river basin were generalized and divided into 6 porous aquifers and 2 fractured zones based on results of previous studies and groundwater movement as well as classification made considering dominant characteristics either porosity or fractured level.

2. Exploitable ground water reserve for the Ulaabaatar city

354. As of 2007, the central water supply grid for UB city had 96 wells, of which the wells #1–9 and #12–27 were opened between 1961–1974 and the wells #40–46, #48–63 were opened between 1980-1984. In 1980, following ground water deposits and their reserve were approved by the Government of Mongolia. Since then, four new ground water deposits, such as Yarmag-Sonsgolon, Buyant Ukhaa, Uvur Gorkhi, and Terelj-Tuul, were newly discovered.

Table 79. Tuul Basin Alluvial Ground Water Deposits Nearby Ulaanbaatar City

Name	Reserve, thousand m^3/day		Type of consumption
	A+B	C1	
Tuv	90.3	34.8	Drinking water and industrial
Upper	89.7	-	Drinking water and industrial
Industrial	30.3	-	Drinking water and industrial
Meat Processing Plant	8.6	-	Drinking water and industrial
CHP-1	3.5	-	Technical
CHP-2	4.92.5	-	Technical
CHP-3	41.4	-	Technical
CHP-4	7.2	-	Technical

Name	Reserve, thousand m^3/day		Type of consumption
Others		35.8	Technical
Total	**278.4**	**70.6**	

Table 80. Newly Discovered and Surveyed Ground Water Deposits Around Ulaanbaatar City

Name of deposit	Reserve, m^3/day
Yarmag Sonsgolon (2011)	26,201
Buyant Ukhaa new district (2010)	22,550
Uvur Gorkhi (2003)	11,750
Terelj-Tuul (2007)	40,062
Khui Doloon Hudag (2007)	3,845
	104,408

355. Ulaanbaatar city has seen a sharp increase in ground water consumption in recent years due to rapid growth of its population. According to a survey in 2010 by the city government, there were around 800 water wells are being used by the city residents and entities that exploit 339.7 thousand m^3 ground water per annum (Jadambaa, 2009).

356. The central water supply grid of the UB city comprises of three main water supply sources: namely Central source, Industrial source and Meat Processing Plant. Besides of the three main sources, there are three other supply sources, namely Upper, CHP-3 and CHP-4, that consists of 218 boreholes. The total ground water reserve of these main sources is 278.4 thousand m^3/day. Ground water exploitation amount from these sources equal to 261.6 thousand m^3/day and from other 576 individual water wells in the city equal to 78.1 thousand m^3/day. The total ground water exploitation amount is currently at 339.7 thousand m^3/day.

357. There is a water reservoir area locates adjacent to the Tolgoit subcenter on northwestern side. The reservoir area is owned by USUG and occupies approximately 65.7 hectares of land. There are three small well houses within the reservoir area.

Figure 77. Water Reservoir Area on Northwest of the Tolgoit Subcenter

3. Groundwater quality

358. Along the Tuul river valley, quality of the groundwater supply resources of Ulaanbaatar is satisfactory. Water in the Tuul river valley found in alluvium deposit and it is very clear and soft, and its chemical composition belongs to the first grade of calcium group of the hydro carbonate class. However, the water quality and chemical composition of wells and boreholes drilled in other areas and zones other than Tuul river valley vary a lot.

359. According to the results of previous studies and analyses made in the water samples taken from wells located in the vicinity of Ulaanbaatar city, especially some water points on its north-west, north and east have mineralized water, most well water is hard, chemical composition is of hydro carbonate class and belongs to the calcium group water. But the water of the sedimentary rocks in the Tuul river valley has low mineralization and chemical composition is of hydro carbonate class and calcium group. This water is clear and soft and it is of the types of 1 and 2.

360. In order to identify ground water pollution, water samples were taken from the wells that are being used for the UB city central water supply system. In order to determine changes in water quality over years, we have used water quality survey results made in 2009, 2010, 2013, and 2014. All survey results were compared to the Mongolian Standard on Drinking water MNS900:2005.

361. 2010, 2013, and 2014 water quality surveys were conducted within the hydrogeological exploration works and water quality testing were made at the lab of Geo-Ecological Institute. Below table

shows lab test results for water samples taken from the wells # 1, 6, 8, 9, 21, 29, 31, 47, 53, and 54 of central water supply system during surveys in 2009 and 2014.

4. Permafrost in Ulaanbaatar area

362. Ulaanbaatar lies in a discontinuous permafrost region of Mongolia. Boundary and suites of the permafrost, found over the central and northern parts around Nogoon Nuur and Ikh Toirog, were determined during development of the map of Ulaanbaatar at scale 1:10,000 on the basis of the previous research materials and drilling and geophysical survey undertaken during the research. This research registered that upper edge of the permafrost starts at 2.5-2.7 m and maximum thickness reaches 35 m. Drilling and temperature measurement, undertaken in 2002, did not find any permafrost up to 8 m and thickness of permafrost does not exceed 20 m. Permafrost of the study area is stable in high temperature which fluctuates between -0.1˚C and 0.3˚C. The research found that the permafrost process around Nogoon Nuur was relatively active or intensive (Tavan Undes LLC, 2003, page 12).

363. On the territory of Ulaanbaatar, annual and seasonal permafrost soil is spread in relation to land surface formation and climate feature. The annual permafrost intermittently and patchily spread here (Tumurbaatar, 1995). The annual permafrost spreads on relatively small area in intermittently through average high mountains near Tolgoit, Selbe, Uliastai and Gachuurt river outfalls in north part of the Ulaanbaatar. But above mentioned rivers valleys and outfalls of Baruun Salaa and Zuun Salaa rivers in Tolgoit, Belkh and Selkh rivers, Sharga Morit and Khandgait rivers in Selbe river, Zuun gol and Baruun gol, Urd Bayn gol rivers in Uliastain river, Shijir, Shavart and Bugat rivers in Gachuurt river valley, the long-term permafrost spreads patchily. In other parts along or in low parts of land surface, medium bare mountain slopes and low hills relic soil spreads in seasonal permafrost. The annual permafrost spreads mostly in valley bottom and back side of mountains, humid sandy and argillaceous debris. Here phenomenon of cold salient, seasonal and annual cold fraction and overflow is commonly occurred by impact of the permafrost process. Furthermore, various micro types from the permafrost are derived in hollows and convenes. The most occurred phenomenon of the permafrost is the overflow “toshin”. It is related to seasonal freezing and formed in river, stream and sprig beds, and sometimes it occupies even side areas. When it gets warm in spring its ice melts and breaks valley bottom in some extent.

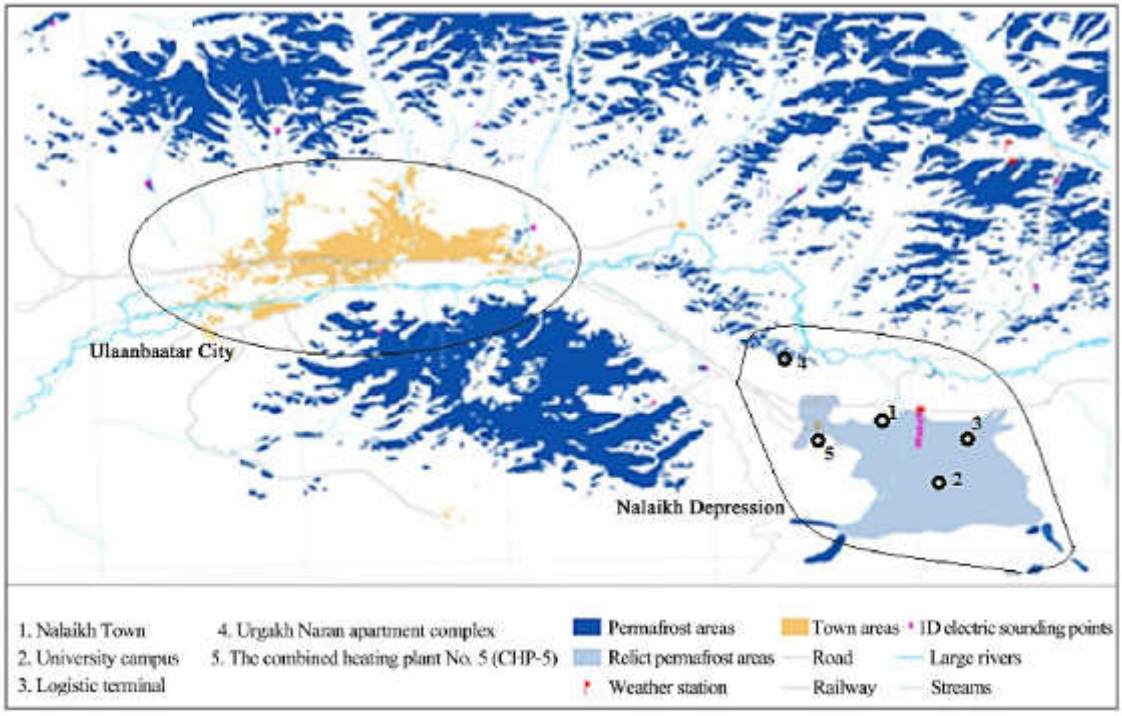
364. Annual absolute thickness of the permafrost is 15–40 m in thick river beds, hollow and convex regions, 25–120 m on top of high mountains and their back slopes and average thickness is 30–100 m. Seasonal freezing of relic soil in natural normal condition of annual permafrost and its melting is 2.7–3.4 m in alluvia gravel, gravelly sand and sandy soil or in river beds, 4.0–5.6 m in sandy soil with broken rocks of mountain slopes, 2.8- 3.1 m in mountain back slope soil and 5.1–5.4 m in mountain top soil and sediment (Sharkhuu S., 2002).

365. Annual mean temperature of the relic soil freezes from zero degrees and its seasonal freezing and melting depth size decreases, when its loamy, fatty and humid feature is increased. In coherent to it, the relic soil seasonal melting average depth does not exceed over 2 m in marsh area of riverbeds and mountain flat slope and reaches at 3–4 m on valley slope dry area. Dominant average freezing of the relic soil seasonally is 2.5–3.5 m deep in average, but it does not exceed over 1.5–2.0 m in argillaceous debris enriched by humidity and reaches at 4–5 m in broken sandy debris lack of humidity in annual and seasonal permafrost process and phenomenon spongy debris spread is the most common in bottom of valleys and hollows regarding humidity and less distributed to mountain side slope, even in south slope.

366. For the last year’s depth of permafrost relic soil is presumably to decline and annual permafrost to be changed in south line of the relic soil due to natural and human activities, which was mentioned by researchers of Institute of Geography. It is clearly observed in patchily spread areas, where the

permafrost depth declined, marshes along rivers dried up and seasonal permafrost is decayed. Due to loss of the permafrost relic soil forestation and reproduction is stagnated and stretches from forest landscape to steppe landscape that affects loss of plant cover and chases wildlife away from its habitat. Therefore, the annual and seasonal permafrost relic soil and its process influence specifically on natural and socio-economic condition of this area. Currently there is no detailed research on permafrost of the Ulaanbaatar available and it is not possible to define changes made on its phenomenon, proves and relic soil freezing and melting in depth. Figure 78 shows the regional distribution of permafrost near Ulaanbaatar.

Figure 78. Distribution of Permafrost in the Area of Ulaanbaatar



I. Biodiversity

1. Biodiversity in the project area

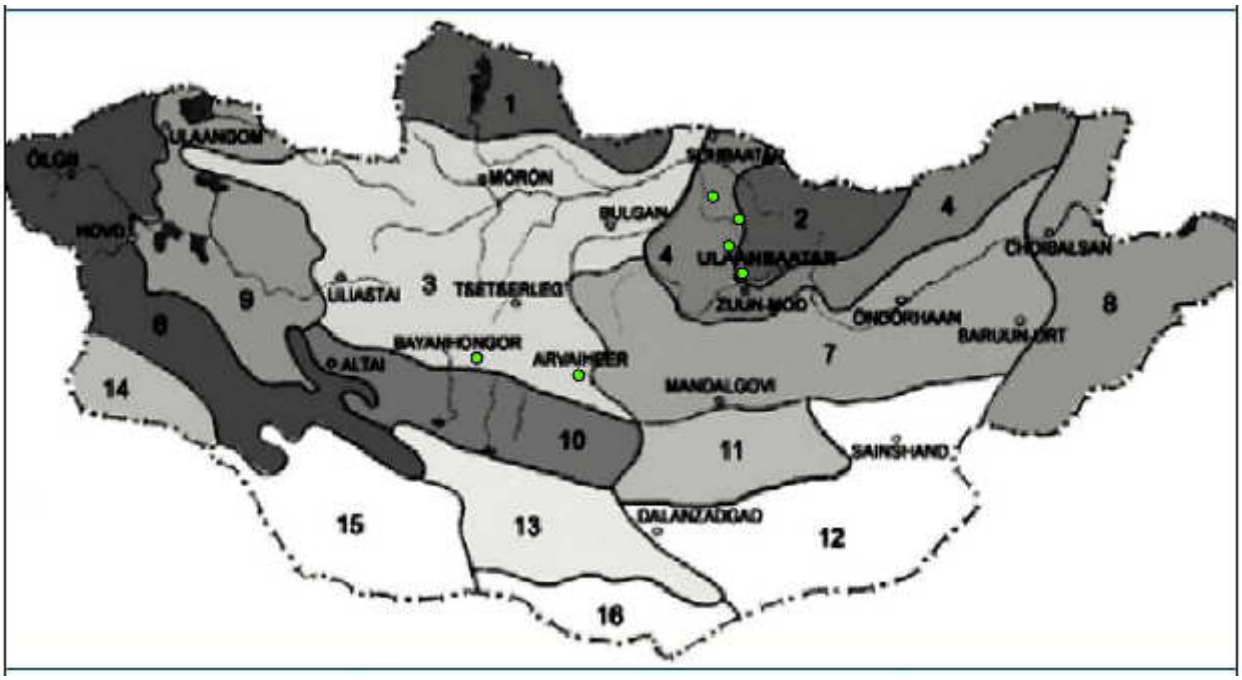
367. Both Sharkhad and Tolgoit subcenters are currently ger areas with dense settlements. There are no biodiversity species exist within the subcenters.

2. Biodiversity around Ulaanbaatar

Vegetation

368. Ulaanbaatar area is encompassed by Khentii Mountain Taiga (northeastern part) and Mongol Daurian Forest-Steppe (central and northwestern parts) Districts out of 16 flora and geographical districts of Mongolia. North and north-eastern parts of Ulaanbaatar city belongs to Khentii mountain taiga zone.

Figure 79. Vegetation Map of Mongolia



Vegetation zones in Mongolia: 1- Khuvsgul ranges, 2- Khentii mountain range, 3- Khangai mountain range steppe-forest, 4- Mongol-Daurian, 5- Great Hyangan, 6- Mongol Altai ranges, 7-Central Khalkha steppes, 8- Eastern Mongolia, 9-Depression of Great Lakes, 10- Valleys of lakes, 11-Northern Gobi, 12- Southern gobi, 13- Gobi-Altai ranges, 14- Zuungar gobi desert, 15- Desert zone south of Altai ranges, 16- Alshaa desert.

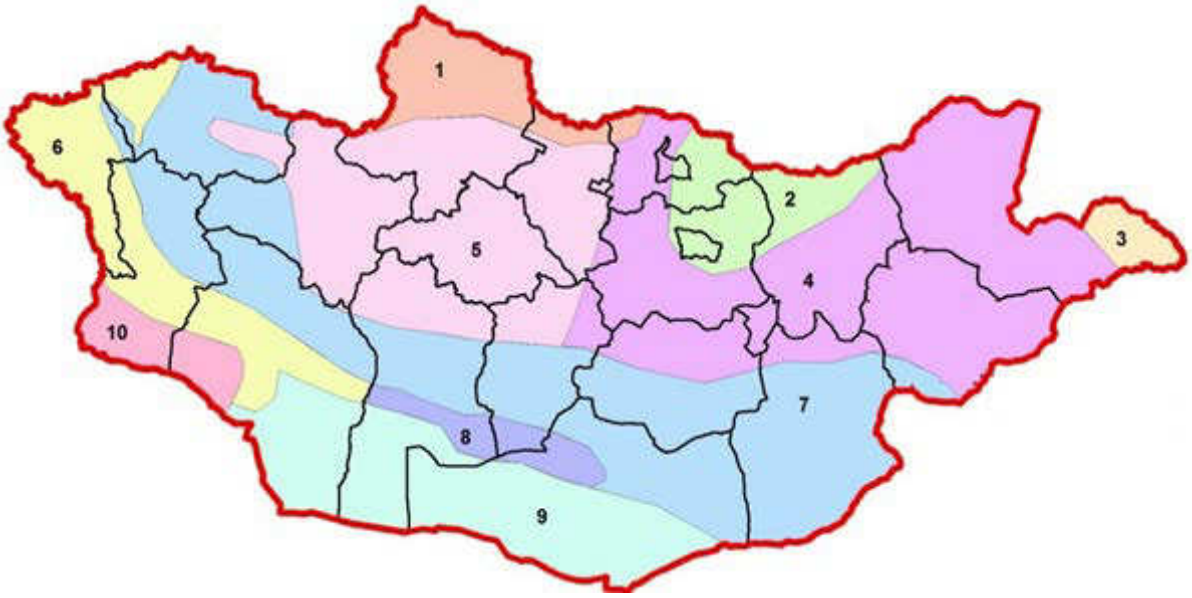
369. 63 vascular species pertaining to 34 genera and 21 families have been listed around the Ulaanbaatar city. There are many species of *Artemisia* and *Chenopodium*. Endemic, restricted range, rare, endangered and Mongolian Red Book-listed species have not been registered herein. Degradation indicator weeds and annual plants occupy more than half of the area, due to the previous earthworks and its location in a settlement.

370. There are 12 species each of Asteraceae and Poaceae, followed by six species Fabaceae Lindl. As for other families, there are 1–3 species of them. The study found that one species families are predominant.

Fauna

371. Since the Tranche 3 project sites are in the midst of densely populated settlement areas, no wildlife species habit in the vicinity of the subcenters. In a broader view, Ulaanbaatar city is located in the Khentii Mountain Range zoogeographic zone.

Figure 80. Zoogeographic Zones in Mongolia



1. Khuvsgul zone
2. Khentii mountain range
3. Western Hyangan
4. Mongol-Daurian
5. Khangai Mountain range
6. Northwestern Mongolia
7. Northern Gobi
8. Gobi-Altay
9. Desert zone south of Altay
10. Western Gobi

372. There are 205 bird species belonging to 65 genera and 25 families of eight orders and 40 mammal species belonging to 26 genera and 12 families of 5 orders in the broader region surrounding Ulaanbaatar city.

373. Mammals including Red Deer, Siberian musk deer and Daurian hedgehog are listed in Mongolian Redbook, while Red Squirrel and Sable are listed as rare. Grey wolf, Lynx, and Manul Cat are listed in Appendix II, Convention on International Trade in Endangered Species of Fauna and Flora.

374. 20 percent or 42 bird species that inhabit Bogdkhan Mountain are rare species that are listed in Mongolian and international laws and regulations.

375. Red deer grazed in Tuul River willow shrubs and even Batkhaan, Khugnukhaan and Avzaga Mountain in Bulgan province through Khustai when its population was abundant. However, its habitat has been affected and deteriorated due to human settlement in any season and illegal collection of berries, nuts and woods in Khentii and Bogdkhan Mountains.

376. 67 percent of 205 bird species that inhabit the proposed project area is migratory species. Sedentary birds also change habitat within short range seasonally. More than half of the birds inhabiting the proposed project area is migratory, while the rest is sedentary species that change habitat seasonally.

J. Ecological resources

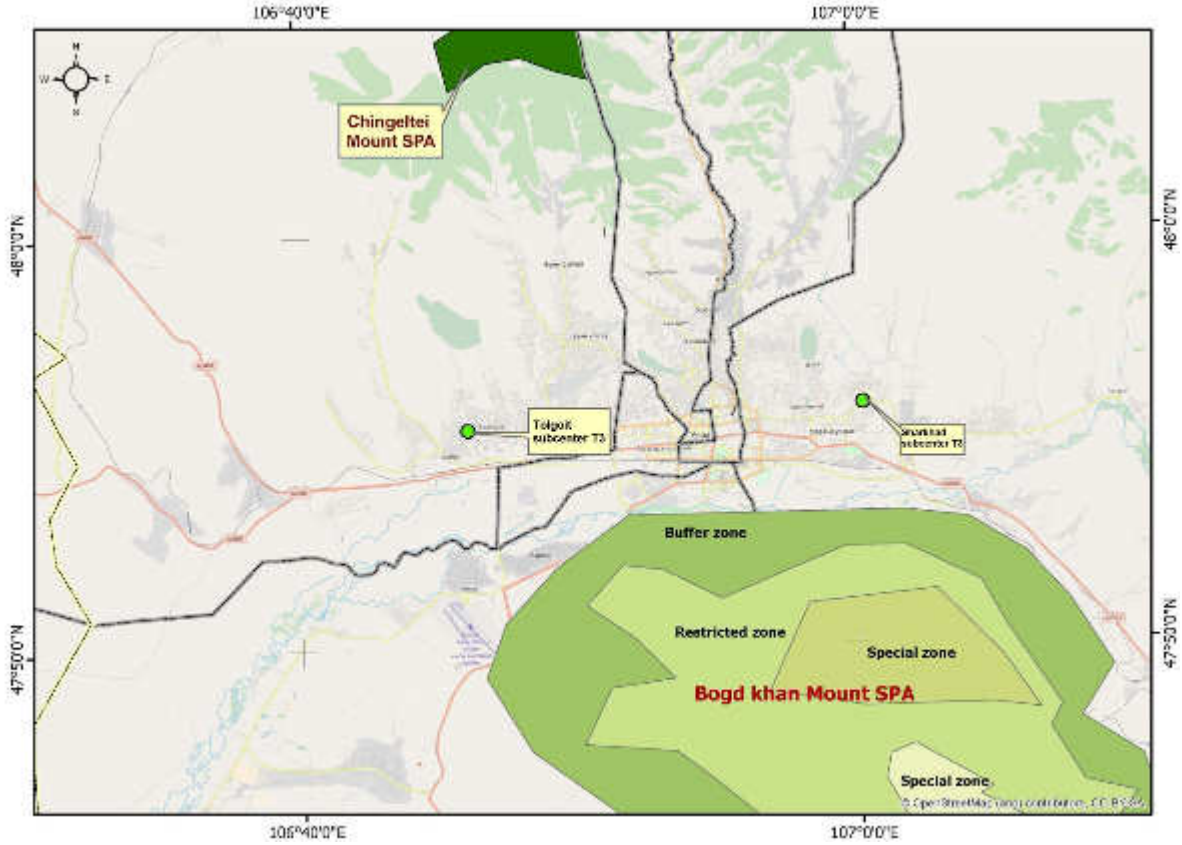
377. Ecological resources of the potentially impacted environment are defined to include the area's flora and fauna, and specially protected areas. The sub-project sites include areas which have very little vegetation or exposed ground which may form habitats for fauna.

378. However, there are a limited number of bird species observable in the Ulaanbaatar city, such as crows and sparrows, common to many urban environments. There are no rare, threatened, or endangered species within the construction boundaries of the sub-projects.

K. Protected areas

379. The closest special protected areas (SPA) to the Tranche 3 subcenters are: Bogdkhan mount SPA (3.2 km) and Chingeltei khairkhan mount SPA (14 km).

Figure 81. Location of the Special Protected Area's and Tranche 3 subcenters



Protected areas around Ulaanbaatar city

380. The Law on Special Protected Areas of Mongolia came into effect on the basis of the Constitution, the Land Law, the Border Law, the Law on Buffer Zones, and other legal acts. The purpose of this law is to regulate relations concerning utilization of and taking areas under special protection, preservation and protection of natural landscape in order to keep particular features of natural zones and belts, their

peculiar formation, forms of rare and rarestfauna and flora, historical and cultural sites and natural sightseeing as well as studying and identifying their evolution. Strictly Protected Areas are divided into following three zones: These include:

(i) Core zone;
(ii) Buffer zone; and
(iii) Transition.

381. National Conservation Areas divided into three zones. These include:

(i) Special zone;
(ii) Tourism zone; and
(iii) Protected area.

382. Each of these Zones has appropriate security procedures stated on the Law of Protected Areas. Ulaanbaatar city has two SPAs that include one strictly protected area, one natural reserve and one national park. See below for the protected areas from the Table 81.

Table 81. Special Protected Areas of Ulaanbaatar

№	Special protected areas	Area size, ha	Distance from the project field
1	Bogdhan mountain strictly protected area	42,192.36	3.2 km south from the project sites
3	Chingeltei hairhan mountain biosphere reserve	4,385.56	14 km north from the project sites
	Total	**338,416.48**	

Bogdhan mountain strictly protected area

383. The strictly protected area includes the areas of Hanuul district, Baynzurkh district of Ulaanbaatar city and Sergelen soum of Tuv aimag and size of the protected area is 42,192.36 ha. Bogdhan mountain is one of the oldest protected area locally as well as worldwide. Mongolians protected Bogdhan Mountain since XII-XIII century, the Hereid Tribe Chieftain Van Han worshipped it as sacred mountain and named it to Han Uul.Bogd Mountain was protected officially from the year 1778. In the year 1957, following People congress's resolution number 31 the mountain was named Choibalsan and the mountain became strictly protected area. In the year 1974, old name of Bogd mountain was changed back and the mountain became strictly protected area. Following resolution #26 of Parliament in 1995, the mountain was classified as strictly protected area accordance with Law on special protected areas.

384. The highest peak of the strictly protected mountain is Tsetsee gun which is 2,268 m above sea level. There are several springs in the Bodhan Mountain for medical treatment. Several species of trees dominate in different areas and this pattern show that biosphere is diverse.For example: In some areas spruce trees are common, north and north west areas pine trees, south and north east areas larch tree. Total 588 species from 256 genuses, 70 families of plants grow in the Bogdhan Mountain. The plant families belong to 18 genus and 80 percent is mountain taiga, 72 percent is steppe plants. The Bogdhan mountain is the northern border of Hentii taiga animal distribution. The Bogdhan mountain is the habitat to the animals of 54 species, 36 genus, 17 families and 6 orders. 1660 insect species from 270 genus of 174 families, 259 species of meso-fauna, 96 species of micro fauna and 194 bird species from 36 families of 25 orders were registered in the Bogdhan mountain.

Chingeltei hairhan mountain biosphere reserve

385. The mountain biosphere reserve area is located in Chingeltei district of Ulaanbaatar. The parliament introduced the resolution number 56 on 22 May 2012 that taking Chingeltei hairhan mountain as reserved area. Chingeltei Hairhan is sacred mountain that located north of the Ulaanbaatar city. Peak height of the Chingeltei Hairhan is 1831m above the sea level. Chingeltei Hairhan is the part of the Hentii mountain range and slopes are steep on the front and back of the mountain is less steep.

386. Chingeltei Mountain is seasonal permafrost. On the west side of the mountain runs Zuun and Baruun Salaa River and on the east side of the mountain runs Selbe River. On the back of the mountain slope is covered with fertile dark brown, forest soils. It is rich in vegetation of forest steppe and mountain steppe plants. It has birch, cedar and larch forest. The ancient legend of the Chingeltei mountain is that mountain speaks to a monk teachers and the monks use to meditate and research wrote books. The Dambadarjaalin monastery located in the Chingeltei Mountain is a burial place for the second Bogd Javzandamba and a historically significant architecture. There are many historical sites that exist. Because of increased household settlement, ecological balance is disturbed by wood logging , increase in livestock, and settlement.

L. Cultural heritage

387. Any historical nor cultural heritage are located within the subcenters.

388. Ulaanbaatar is rich in physical cultural resources. The list of important heritage, cultural and religious sites of Mongolia and its provinces revised in 1994, 1998, and 2008. In this list, total of 460 objects were registered and out of them 175 have to be under State protection and 285 have to be under provincial protection.

389. Gandantegchilen Monastery is located in 300 m distance from the Ulaanbaatar Polytechnical College. Gandantegchilen is the biggest monastery in Mongolia and was constructed by order of the 5th Javzandamba Hutagt in 1809. The first temple was the Gungaachoilin Datsan. It currently has several temples-buildings, a religious school and over 150 monks in residence. It features a 26.5-meter-high statue of Megzid Janraiseg which came under state protection in 1994.

M. Socio-economic condition

1. Demography

390. **Demography of Ulaanbaatar city.** The population of Ulaanbaatar, the capital city of Mongolia, has been increasing rapidly from 0.78 million (Mongolia: 2.40 million) in 2000 to 1.417 million (Mongolia: 3.2 million) in 2018 with an average annual growth rate of 2.9%. There are 380,800 households in the city. This rapid increase of population is chiefly due to a rapid migration from rural area to urban area. At present Ulaanbaatar accounts for 46% of the total population of Mongolia. Average life expectance in Ulaanbaatar city is 71.8 (Mongolia: 71.24) while the figure is 66.5 for males and 75.3 for females. There are 33,700 disabled people live in the city.

391. **Demography of Sharkhad subcenter.** Total population of the five khoroos in the Sharkhad subcenter is 58,163 people belonging to 15,819 households. Gender ratio for Sharkhad subcenter population is 48.8% male residents (28397 persons) and 51.2% female residents (29766 persons). By age group, 31.7% of its population is aged under 18 years, 62.6% is aged between 18 and 59 years and

5.7% is aged over 60 years. Vulnerable social groups in the Sharkhad subcenter includes 95 orphan children, 1,511 households led by single mothers, 236 old aged people living alone and 1929 disabled persons. Key demographic figures for each khoroo in the subcenters are provided in below table.

Table 82. Key Demographic Figures for Sharkhad Subcenter

No.	Key parameters	Khoroo No.9	Khoroo No.17	Khoroo No.19	Khoroo No.22	Khoroo No.24
1	Population	13,416	11,025	11,296	12,971	9,455
2	Number of households	3,656	2,938	2,890	3,580	2,755
3	Male residents	6,560	5,448	5,448	6,338	4,603
4	Female residents	6,856	5,577	5,848	6,633	4,852
5	Number of orphan children	33	14	9	26	13
6	Number of households led by single mothers	478	295	301	265	172
7	Number of old aged people living alone	53	78	9	35	61
8	Number of disabled persons	482	357	335	354	401

392. **Demography of Tolgoit subcenter.** Total population of the 4 khoroos in the Tolgoit subcenter is 61,537 people belonging to 16,823 households. Gender ratio for Sharkhad subcenter population is 48.7% (29,971 male residents) and 51.3% (31566 female residents). By age group, 33.3% of its population is aged under 18 years, 58.6% is aged between 18 and 59 years and 8.1% is aged over 60 years. Vulnerable social groups in the Tolgoit subcenter includes 71 orphan children, 512 households led by single mothers, 163 old aged people living alone and 1,524 disabled persons. Key demographic figures for each khoroo in the subcenters are provided in below table.

Table 83. Key Demographic Figures for Tolgoit Subcenter

No.	Key parameters	Khoroo No.1	Khoroo No.2	Khoroo No.3	Khoroo No.22
1	Population	15,159	13,589	11,365	21,424
2	Number of households	3,956	3,654	2,510	6,703
3	Male residents	7,285	6,592	5,699	10,395
4	Female residents	7,874	6,997	5,666	11,029
5	Number of orphan children	18	20	9	24
6	Number of households led by single mothers	115	89	233	75
7	Number of old aged people living alone	76	40	11	36
8	Number of disable persons	438	315	258	513

2. Unemployment and poverty

393. **Unemployment.** Unemployment rate in Sharkhad subcenter is at 5.8% and labour participation rate is at 55.5% in 2018 which is 3.9 % higher than the previous year. Unemployment rate in Tolgoit subcenter is at 12.92% in 2018 which is higher than the national average of 9.6%. According to the Mongolian Statistical Yearbook 2016, the 'Registered Unemployment Rate' for Ulaanbaatar is 1.6%. However, this is the rate of people that are officially registered unemployed. The book also provides an

'unemployment rate' which is 14% for the Ulaanbaatar City, derived from a new methodology of calculation based on the results of a Labor Force Survey.

394. **Poverty.** The Mongolian Statistical Yearbook 2016 provides background data on poverty levels within the City. The Poverty Headcount Index is a widely used poverty measure, giving the percentage of the population whose consumption is below the poverty line. For Ulaanbaatar, this rate is 36.7% in 2009, which compares to 38.7% nationally. The analysis of the first Living Standard Measurement Survey (LSMS) provided a profile of the poor and identified the most vulnerable groups in the country. The assessment showed that female-headed households had a higher incidence of poverty.

395. Income comes from different sources and varies according to location as shown in Table 84.

Table 84. Monthly Average Income per Household

Types of income	National average (%)	Ulaanbaatar city (%)
Income Total	100.0	100.0
Monetary Income Total	91.5	97.0
Wages and salaries	48.5	57.0
Pensions. allowances and compensation*	20.0	18.3
Income from livestock products	5.3	0.2
Income from crop products	0.5	0.0
Income from nonagricultural production and services	10.7	14.0
Other income	6.5	7.5
Food and nonfood products received from others free of charge	3.1	2.8
Food consumption from own business	5.4	0.2

Source: National Statistics Book, 2016.

396. The survey found that there was a strong correlation between unemployment and poverty with 58 % of the unemployed being poor. Unemployment was a particularly difficult problem in both the urban and rural areas. In addition to the 100,000 already unemployed the civil service reform will create another 30,000-unemployed former public service employees. In addition, over 25,000 people enter the labor market annually finishing their education. Among the rural poor 35 % of the very poor and 14 % of the poor were unemployed. Among the urban poor, the situation was even worse with 55 % of the very poor and 34 % of the poor being unemployed.

3. Economic development

397. **Ulaanbaatar city.** Ulaanbaatar is the political, economic and business center for Mongolia. Nearly all of the biggest business entities, international organizations and the national government institutes are located in the city. Gross domestic production of Ulaanbaatar City accounts for around 56% of the National gross domestic production (GDP). Manufacturing includes production of electricity and heating, metals (such as copper and steel foundries) as well as woolen products such as cashmere and carpets, food, furniture, clothes, construction materials and leather processing. There are 47,000 state and private business operate in the city which includes 1,030 entities with more than 50 employees.

398. **Sharkhad subcenter.** Sharkhad area is automobile market center for the city known for several big outdoor automobile markets such as Da Khuree and Mungun Khuleg. Additionally, there are hundreds of small outlets surrounding the Da Khuree market that are engaged in sales of spare parts, tires and

automobiles maintenance. Most of the residents living in the Sharkhad subcenter are engaged in automobile sales and services. In a wider picture, the Bayanzurkh district is the biggest district in Ulaanbaatar and is a home to various light industries such as meat and animal skin processing, food production and manufacturing of construction materials. Amgalan Heating Plant which provides heating supply for eastern part of Ulaanbaatar is located in 1km distance from the Sharkhad subcenter while Tsaiz market which is the main marketplace for wholesale and distribution of animal skin is in 3km distance from the subcenter.

399. **Tolgoit subcenter.** Tolgoit subcenters is a residential area which comprises of households living in private houses and gers. Each households has its own yard which is usually sized between 400-500 m^2. The main economic activities in Songinokhairkhan district within which the Tolgoit subcenter locate are food processing, manufacturing of construction materials and poultry farming. Several of the biggest food processing plants in the nation, such as Makh Impex, Makh Market, Teso, Gem International and Talkh Chiher, are located in the Songinokhairkhan district.

4. Education

400. **Ulaanbaatar city.** Mongolia is ranked 117th in human development index among 177 countries. Literacy rate in Mongolia is at 97.8% where male literacy is at 98% while female literacy is at 97.5%. The education institutes consist of pre-school education (kindergarten), mid-level education (primary, middle and high schools) and university education (universities, colleges and TVET's). In the city, there are 661 kindergartens that have 113,521 children 11,812 teachers and 241 middle schools that have 247,960 pupils and 11,281 teachers. 89 of the 96 universities operating in Mongolia are located in Ulaanbaatar city. Total number of university students residing the Ulaanbaatar city is 144,000 which equals to 92.8% of the total students in Mongolia.

401. **Sharkhad subcenter.** There are 6 middle schools (Middle school No.44, 53, 79, 92, 136, and 137) in the Sharkhad subcenter. In academic year 2018-2019, a total of 9107 pupils attended the middle schools in the subcenter. There are 13 kindergartens (state owned kindergartens No.3, 167, 168, 210, 169, 213, 82, 251, and 5 other private owned kindergartens) in the Sharkhad subcenter that have a total of 2,433 children. The state-owned Military University is located in 1.5km distance from the Sharkhad subcenter.

402. **Tolgoit subcenter.** There are 7 middle schools (Middle school No.106, 107, 123, 42, 65, 122, and one private owned school named Nomiin Yos) in the Tolgoit subcenter. Total number of pupils for the middle schools were at 11,941. There is a total of 17 kindergartens (state owned kindergartens No.48, 111, 81, 80, 188, 244, and 10 other private owned kindergartens) that have a total of 3,601 children.

5. Health service

403. **Ulaanbaatar city**. There are 133 primary health care centers operating in Ulaanbaatar city that have 633 doctors, 586 nurses and offered health services to 4.2 million patients in 2016. Each khoroo administration unit in UB city has a primary health care center. There are 12 district and emergency hospitals in the city that have 883 doctors, 889 nurses and offered health services to 2.38 million patients in Health condition in of Khovd city.

404. **Health service in the project area**. Local residents in the Sharkhad and Tolgoit subcenters apply to primary health care centers in their respective khoroos. If a higher level of treatment or diagnostics are necessary, they apply to Bayanzurkh and Songinokhairkhan district hospitals. Currently, 5 primary health

care centers (family healthcare center) and one hospital (State Mental Hospital) are located within the Sharkhad subcenter and 4 primary health care centers in Tolgoit subcenter. The primary health care centers offer basic level health services (first aid, vaccination, general physical checking) to the local khoroo residents and merchants in the subcenters while the State Mental Hospital offers treatment to various mental diseases for patients from all over the country.

6. Land use pattern

405. The land use pattern map of Ulaanbaatar is shown below in Figure 82 which shows the new land use classification and zoning scheme of Ulaanbaatar and Table 85 gives the details of Control of building use by Land Use Zones. With its territory of 156.412 million ha, Mongolia occupies 17th place by the size of territory and first place by per capita land resources (65 ha) in the world. Per capita agricultural land in Mongolia (53.8 ha) accounts for 20 times over the world's average.

406. The land, except that given to the citizens of Mongolia for private ownership, as well as the subsoil with its mineral resources, forests, water resources and wildfowl shall be the property of the State. The State may give for private ownership plots of land, except pasturage and land under public utilization and special use, only to the citizens of Mongolia. This provision shall not apply to the ownership of the subsoil thereof. Citizens shall be prohibited to transfer the land in their ownership to foreign citizens and stateless persons by way of selling, bartering, donating or pledging as well as from transferring it to others for their possession and use without permission from competent State authorities. The State shall have the right to hold landowners responsible for the land, to exchange or take it over with compensation on the grounds of special public need, or confiscate the land if it is used in a manner adverse to the health of the population, the interests of environmental protection or national security. The State may allow foreign citizens, legal persons and stateless persons to lease land for a specified period of time under conditions and procedures as provided for by law. Also, in provision 16.2 of the Constitution was indicated that the citizens of Mongolia are guaranteed to enjoy the following rights and freedoms: the right to a healthy and safe environment, and to be protected against environmental pollution and ecological imbalance.

407. In the provision 17.2 it was indicated that “1. Citizens of Mongolia, while upholding justice and humanity, shall fulfill in good faith the following basic duties: 2) to respect dignity, reputation, rights and legitimate interests of others;” and in the provision 19.1 “The State shall be responsible to the citizens for the creation of economic, social, legal and other guarantees ensuring human rights and freedoms, to fight against violations of human rights and freedoms and to restore infringed rights.”

408. As per the Provision 10 of Law on Land of Mongolia, land is classified in six categories as stated below in Table 85:

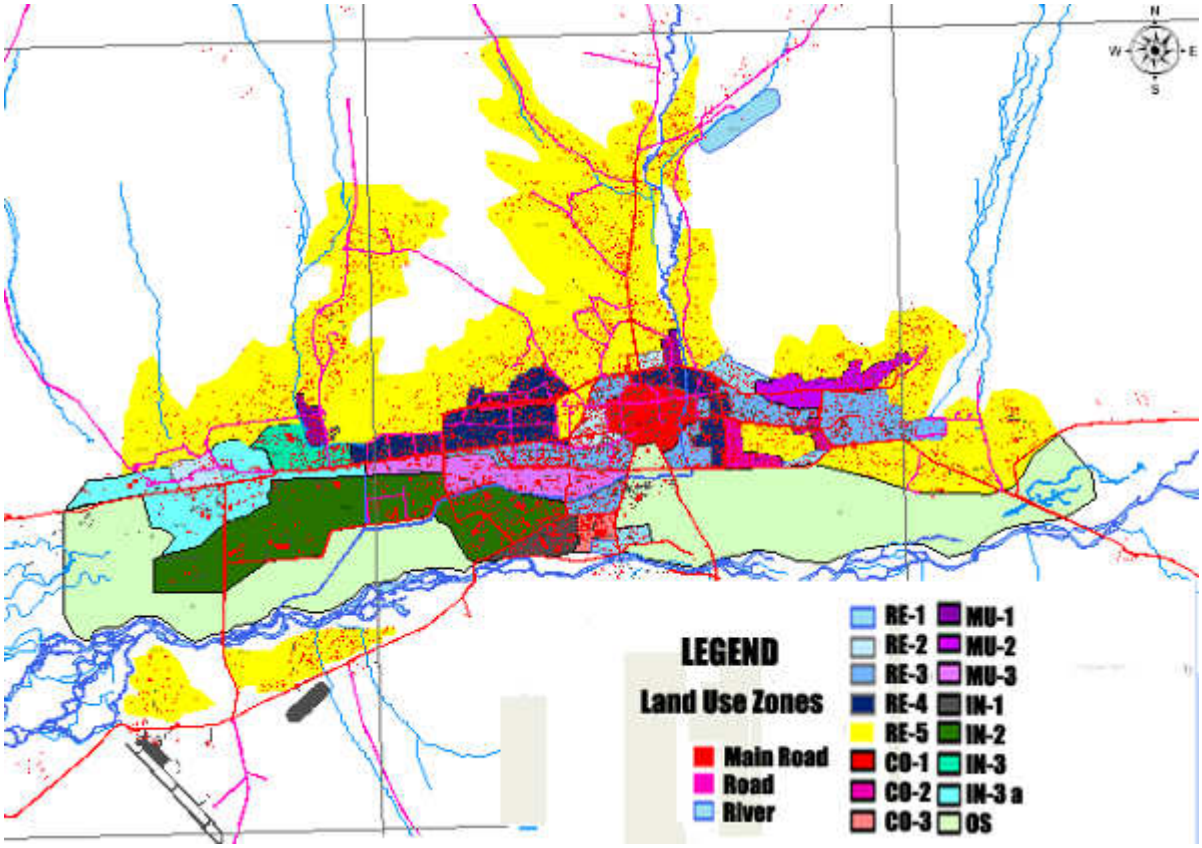
Table 85. Classification of Land Use of Mongolia

No	Classification of Land Use
I	Agricultural land
1	Pasture land
2	Hay making area
3	Crop land
4	Abandoned land
5	Land under Agricultural building and facilities
6	Land unsuitable for agricultural use
II	Urban Land
7	Land for Construction and facilities
8	Public land/area
9	Industrial area

No	Classification of Land Use
10	Mining land
11	Ger area
III	Roads and Communication Land
12	Road
13	Railway
14	Land for air transport
15	Communication land
16	Land for port of water transport
IV	Forest Land
17	Forest covered area
18	Logged area
19	Land for forest nursery
20	Forest restoration area
21	Other land area of forest
V	Water Land
22	Rivers
23	Lakes and founds
24	Creek and springs
25	Glaciers and
VI	Land for State Special Needs
26	Protected Areas
27	Border zone area
28	Land for National Defense
29	Land for International Diplomatic Consulates
30	Land for Scientific experiment and meteorological observation and monitoring
31	Inter-Aimag reserve pastureland
32	Hay making area of State Forage Foundation
33	Oil and petroleum contracted land
34	Land for economic free zone
	GRAND TOTAL

Source: Report on Mongolian Environmental status in 2013–2014.

Figure 82. Land Use Pattern in Ulaanbaatar



Source: Gantulga Gombodorj and Chinbat Badamdorj. Urban land use classification and functional zoning of Ulaanbaatar city, Mongolia, 2010.

7. Infrastructure development

Infrastructure development in Ulaanbaatar city

409. Ulaanbaatar city the biggest city and national capital of Mongolia. It is the main hub for Mongolia's railroad, sealed road, communication and fiber optic cable networks. Mongolia's railway line which connects Russia and China is 1,110 km long and passes through the Ulaanbaatar city.

410. Ulaanbaatar city has three main sealed road gates. Songinokhairkhan Tuv is the western gate which connects northern and western province of Mongolia to the city. It locates in 22 km distance from the city center. Bayanzurkh gate is the eastern gate which connects eastern and south-eastern provinces to the city. It locates in 17 km distance from the city. Aitsiin Davaa is the southern gate which connects Umnugobi, Dundgobi and Tuv provinces to the city. It locates in 25 km distance from the city center.

411. An international airport called Chinggis Khaa airport connects Ulaanbaatar with Beijing, Moscow, Seoul, Tokyo, Berlin, Hong Kong, Singapore and other destinations.

412. Electrical power is supplied by the Central Electricity System (CES), which produces around 2.66 billion kilowatt hours (1998) of power. Five coal-fired power stations provide almost 85 percent of the

total, with the balance imported from Russia. During the 1990's, attempts were made to renovate the CES with international aid and to build small hydroelectric and wind-powered stations. Power interruptions are common, and some remote areas remain without electricity, where diesel oil, wood, and dried horse and camel dung is used as fuel.

413. The Ulaanbaatar city has centralized water supply and sewage networks that cover central parts of the city. The city supplies its water consumption from ground water boreholes in Tuul river valley. Wastewater generated by dwellings in the city has been collected by a centralized pipelines which are connected to the Central Waste Water Treatment Plant which located in western part of the city.

Infrastructure condition in the Sharkhad subcenter

414. Da Khuree street (a paved road) traverses through the Sharkhad subcenter. The road has high traffic intensity due to operation of the Da Khuree automobile market. Existing water supply and sewage pipelines crosses through the subcenter along the Da Khuree street. However, only few big buildings have been connected to the water supply and sewage pipelines. Local residents who live in ger are not connected to any utility pipelines. They purchase water from the nearby kiosks and burn in stoves in their home to generate heating during winter seasons. All households have toilet pits in their yard. Solid waste is collected by households within their respective yards temporarily before being transported to the central landfill sites with waste trucks of urban service agency once a week. All entities and households in the subcenter are connected to power lines.

415. Gers and private houses in the subcenter are not connected to heating, water, and sewage pipelines. Central heating network connection has already reached the southwestern boundary of the subcenter. Households in the subcenter supply their drinking and domestic use water from nearby wells and water distribution points. All households have toilet pits in their yard. Solid waste is collected by households within their respective yards temporarily before being transported to the central landfill sites with waste trucks of urban service agency once a week. All entities and households in the subcenter are connected to power lines.

Infrastructure condition in the Tolgoit subcenter

416. The main road Nairamdal resort traverses through western part of the Tolgoit subcenter. Orbit street (a paved road) traverse through the project area. It is planned that a new paved road which connects Orbit street to Tolgoit street will be constructed within the project. Entities and households in Tolgoit subcenter are connected to power lines but not connected to other centralized lines, such as heating, water supply and sewage pipelines. Households in the subcenter supply their drinking water from nearby wells and water distribution points. All households have toilet pits in their yard. Solid waste is collected by households within their respective yards temporarily before being transported to the central landfill sites with waste trucks of urban service agency once a week. All entities and households in the subcenter are connected to power lines.

N. Current condition of waste management

417. Current solid waste management system in ger area of Ulaanbaatar city comprises of following components:

(i) Domestic solid waste is collected by households within their respective yards temporarily before being transported to the central landfill sites with waste trucks of urban service agency once a week.

(ii) All districts have specialized urban service agencies who are responsible for collect waste generated by entities and residential areas in their respective districts and transport the waste to central dumpsites of the city. These agencies have their own waste transport vehicles.
(iii) There are three central dumpsite locations around Ulaanbaatar: Narangiin Enger dumpsite locates on northwestern side, Ulaanchuluut locates on northeastern side and Moringiin Davaa on southwestern side of the city respectively.

418. Medical waste management system in Ulaanbaatar comprises of following components:

(i) All hospitals and PHC's are responsible for having a designated place to collect waste they generate;
(ii) Element LLC (a specialized and licensed agency for medical waste handling) will send its trucks to hospitals on weekly basis to collect and transport the medical; and
(iii) Medical waste collected from hospitals are handled at the medical waste handling site at Narangiin Enger operated by the company.

419. Element LLC employs 55 staff and operates 10 specialized trucks and collects medical waste from every hospital 2–3 times a week. Their medical waste landfill facility at Narangiin Enger comprises of 3 building: office building, autoclave and incineration building and material warehouse building. This facility is being run in PPP mode based on international model [18]. MOH requires all hospitals and FHC's in UB city to contract with Element LLC to remove the medical waste.

O. Climate change risks in Mongolia

420. Climate change assessment for Tranche 3 was conducted in November 2019. A summary of Climate Risk Screening and Assessment report is provided in paragraphs below.

1. Summary of climate risk screening and assessment

421. Climate risk identification, program vulnerability and adaptation assessments are based on a review of Mongolia climate change reports and data prepared by ADB, World Bank, UN, IPCC, GCF and Government of Mongolia climate change policy documents and their Third National Communication to UNFCCC. ADB project reports for related Mongolia and regional projects were also reviewed. In addition, meetings were held with key government stakeholders and local government *khoroo* officials in both subcenters to gather personal on-the-ground inputs. GHG reduction calculations were based on national energy consumption figures and international energy/GHG emission and carbon capture rates. ADB's TA-9414-RE: Supporting Adaptation Decision Making for Climate Resilient Investments was also referenced.

422.**Finance:** of the total $66.289 million (base cost) budgeted for capital expenditure $12.17 million (18.4%) is identified as contributing to climate change adaptation while an additional $1.12 million (1.7%) contributes to climate change mitigation.

[18] The land belongs to the Ulaanbaatar Government while equipment belongs to Element LLC. It has collection facility and autoclave unit for disinfection. After autoclave disinfection the staff disposes the waste using a land filling method which is scientific in nature.

A. Sensitivity of project component(s) to climate/weather conditions and sea level	
Project components: **Construction, materials and operation of:** 1. Roads and bridges 2. Water supply, wastewater 3. District heating 4. Electricity, telecommunications 5. Drainage infrastructure 6. Economic and social facilities 7. Green spaces	**Sensitivity:** 1. Extreme seasonal temperature variations 2. Increased summer temperatures. 3. More severe and unpredictable precipitation events - flooding. 4. Increased threat of droughts and *dzuds*. 5. Depletion of water resources.

B. Climate Risk Screening	
Risk topic:	**Description of risk:**
1. Extreme seasonal temperature variations	1. Thermal stress on all exposed construction materials and structures.
2. Increased summer temperatures.	2. Heat wave health risks and additional thermal stress on construction materials. Increased evaporation rates for limited water resources. Threats to landscape vegetation.
3. More severe and unpredictable precipitation events - flooding.	3. Flooding risks including damage to above ground infrastructure - roads, bridges and drains, and economic/social facilities.
4. Increased threat of droughts and *dzuds*.	4. Damage to landscape vegetation, increased dust during and after construction.
5. Depletion of water resources.	5. Threat to water supply and wastewater operations.
Climate Risk Classification: Moderate	

2. Climate risk assessment

423. **Extreme seasonal temperature variations:** Mongolia has long adapted to extreme temperature changes in its establishment of construction standards, materials and technologies. This places thermal stress on all exposed construction which will increase with projected increases in temperature spreads.

424. **Increased summer temperatures:** Mongolia is projected to experience some of the world's highest summer temperature increases due to climate change, as much as 6^{o}C (GCF Country Climate Profile). This will increase thermal stresses on all construction materials and structures. It will also increase the potential for heat waves with related health threats to residents, particularly the elderly and other vulnerable groups. Urban heat sink phenomena are more likely to be experienced. Damage to landscape and agricultural vegetation can be expected. Water evaporation rates will increase.

425. **More severe and unpredictable precipitation events:** Flooding is identified as the greatest threat to project investments and the well-being of project communities. A projected increase in the frequency of thunderstorms and short, high-intensity rainfall events will increase the number and severity of flood events causing increased asset loss/damage, increased health risks from overflowing pit latrines until they are entirely replaced, and more disease from standing water. Overall annual levels of precipitation are projected to increase slightly but primarily with increased amounts of winter snow fall. More snow will mean more dangerous roads, more icing and more structural loading on buildings and other exposed infrastructure.

426. **Increased threat of droughts and *dzuds*:** Temperature increases and more erratic precipitation events will increase the number and severity of droughts. Higher temperatures will accelerate evaporation of Mongolia's already limited and diminishing natural water resources. More droughts will lead to an increase in dust storms which are already a serious health and comfort issue throughout much of the

country. Winter temperatures are not projected to increase as much as summer temperatures, but increased snowfall is projected and may increase the severity of *dzuds* and their impacts on traditional grazing and herds. This in turn will lead to more rural-urban migration and even greater challenges for *ger* area infrastructure and services, and further increase the need for *ger* area redevelopment.

427. **Depletion of water resources:** This is a national climate change impact that is affecting water supply and therefore development throughout Mongolia. Glaciers, lakes, rivers and aquifers are drying up. A shortage of water supply will eventually impact Ulaanbaatar and have negative impacts on the on-going operation of proposed water supply and wastewater networks. It also mandates that all possible due care be taken to conserve and re-cycle water usage in the subcenters in all of the project's investments.

3. Climate risk management response within the project

428. The direct risks of climate change and required adaptation responses to the specific project investments during construction and operational are not significant with the exception of potential flood events that can impact all infrastructure and social-economic facilities. Temperature extremes are well known in Mongolia and the projected increased spread from summer to winter will not require anything new in terms of construction standards but will require increased attention to construction details and likely higher maintenance budgets. However, in addressing the wider need for climate change adaptation and mitigation in Mongolia, and Ulaanbaatar in particular, there are several recommended responses and co-benefit opportunities to reduce GHG, improve water resource use, mitigate heat waves, save energy and generally improve the well-being of *ger* area residents that can be integrated into the project:

429. **Roads:** higher summer temperatures will require attention to expansion joint construction and ensured quality of asphalt. Roads are most vulnerable to increased flooding and cross-section designs must accommodate both increased on-surface drainage and runoff from adjacent neighborhoods. The innovative use of "sponge" infrastructure is suggested wherever possible in place of traditional non-porous structures. This will reduce the damage caused by high-speed storm water runoff and provide opportunities for re-use of that water for roadside green irrigation which in turn stabilizes soil, reduces dust and contributes to urban cooling. This is fully in-line with ADB's current push to maximize the use of nature-based infrastructure as a climate change adaptation and resource conservation mechanism. Regular maintenance is always the key to asset preservation and increased maintenance budgets should be planned for.

430. **Bridges:** will require more robust design and construction of abutments to handle more severe storm events, and expansion joints designed to handle a wider temperature range.

431. **Water supply, wastewater networks:** no significant impact is expected on any buried infrastructure network as long as surface drainage infrastructure prevents undue erosion. Permafrost is not expected to be an issue in these higher-level subcenters. The main risk is through depleted national water resources which is beyond the scope of this project to directly address but nonetheless to be mitigated through as many water conservation measures as possible (see drainage and social-economic facility comments).

432. **District heating:** no significant climate change impact is expected on the underground heating infrastructure. GHG reductions will eventual result once *ger* areas are redeveloped into multiunit residential buildings. A slight reduction in heating requirements can be expected with marginal winter temperature increases over time, but not sufficient to drastically alter design specifications.

433. **Electricity and telecommunication networks:** no significant climate change impacts are expected as long as these are underground services. Above-ground infrastructure, if any, will be exposed to more severe storm events and the potential for increased icing and snow loading during the winter.

434. **Drainage infrastructure (Tolgoit in particular):** drainage infrastructure will be under risk from an increased number and severity of precipitation events. Failure of drainage systems in turn threatens other community assets, both public and private. As noted above, it is recommended that more nature-based “sponge” infrastructure be utilized in place of traditional non-porous construction. This will slow down water speeds, increase the re-use of storm water to maintain green spaces with related cooling, dust control and erosion control. Maximizing use of rapidly diminishing water resources wherever possible is necessary. Examples of appropriate “sponge” infrastructure are found throughout Ulaanbaatar in similar drainage situations. Dedicated drainage networks can also provide the co-benefit use as public green corridors and pedestrian ways.

435. All economic and social facilities: These are proposed as “green” buildings and by definition should employ the full range of “green” elements including orientation for maximum winter solar gain and minimal winter wind impact; high insulation; natural ventilation; low-energy lighting; water-saving toilets; rain water harvesting; planted green surroundings; etc. Regular and adequate maintenance of all systems is necessary to maintain the advantages.

436. Green spaces: maximized throughout with drought and extreme temperature-resistant planting to control drainage and soil erosion, contribute to urban cooling, and act as carbon sinks while also serving as recreation spaces improving urban livability for residents. Adequate maintenance is essential and can be coordinate in partnership with local Community Development Organizations (CDO).
Public awareness, participation and capacity development: on-going information, education and communication (IEC) programs are required at all levels starting with ensuring that high-level decision makers are fully informed and supportive.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

437. In this chapter, Tranche 3 impacts are assessed, and corresponding mitigation measures are provided. The project impacts classified into 3 phases of the project implementation: pre-construction, construction and operation phases. The chapter is similarly structured accordingly.

438. Tranche 3 (Tranche 3) of the Ulaanbaatar Urban Service and Ger Area Development and Investment Program will bring following benefits to the local communities in the Sharkhad and Tolgoit subcenters:

(i) Households and businesses will have access to a piped potable water supply;
(ii) Connection to centralized sewage pipelines will help to reduce soil contamination in the ger area by terminating the use of toilet pits;
(iii) The infrastructure to collect and convey domestic waste away from ger homes and businesses for proper treatment will increase environmental quality (e.g., soil and groundwater) thereby reducing sickness and disease, and improve overall quality of life in the subcenters;
(iv) The provision of access to central heating will greatly improve quality of life, and most significantly cause major improvements to ambient winter air quality from reductions in smog, and the critical health impairing particulate matter 2.5 from coal and wood burning. Potential removal, or significant reduction in the use of coal-fired cooking stoves for heating will also significantly improve indoor air quality;

(v) New and improved roadways and sidewalks in ger subcenters will greatly improve mobility, and along with water supply and sewerage, will attract much needed commerce and income development in the subcenters; and
(vi) The physical social service support facilities to be constructed will be greatly improve the quality of life and reduce domestic stress in the subcenters.

A. Impacts and Mitigation Measures During Pre-Construction Stage

1. Resettlement

439. A detailed land acquisition and resettlement plan (LARP) was prepared during the design period. Land affairs department of MUB will be responsible for carrying out negotiation with the affected households and signing land acquisition agreement with each household that needs to be resettled. Compensation will be set according to relevant domestic regulations and ADB policy requirements.

2. Temporary use of land

440. The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labor camps for human resource to avoid environmental impact and public inconvenience.

441. These locations must comply with the local laws and regulations and need approval from authorities to utilize these facilities (access roads, telecommunication, and pipe borne water supply). It is important that selection of temporary lands does not infringe upon adjoining residential areas, water bodies, natural flow paths, and access roads to garages, and other amenities in the area.

3. Type and scale of insulation of pipelines

442. The design shall introduce energy efficiency elements (heat meters; heat insulation that meets the requirements on Mongolian Energy Efficiency Regulations; LED lighting; triple glazed windows, etc.). Type and scale of insulation to be installed in the buildings will be designed by the construction company as per norms followed in Mongolia.

4. Associated facilities

443. Associated facilities for the Tranche 3 are shown in the table below. Once the detailed design for utility lines, new roads and social service buildings are completed, the PMO will apply to relevant domestic authorities, such as USUG, UB Power Distribution SOE, UB Heating Distribution SOE and Communications and Information Technology Authority, to obtain necessary technical permissions.

Table 86. Associated Facilities for Tranche 3

Fields of public utility	Associated facilities		IEE section with detailed description	Operational entity
	Sharkhad subcenter	Tolgoit subcenter		
Water supply network	Existing water supply pipelines as D110, D160 mm with length of 9.0 km	Existing water pipelines with length of 12.9 km and diameter of D110~250 mm	Chapter III, Section B-2	USUG (Water supply and distribution authority of Mongolia)
	Existing water reservoir storage capacity is 500 m^3	Tolgoit Reservoir (V=1,000 m^3) under construction in 2019 by MUB		
	Existing pump station with 2 booster pumps and 1 circulating pump	Existing pump station in Tolgoit has 4 pumps with capacity of 900 to 1300 m^3 per day		
	8 existing water kiosks	6 existing water kiosks		
Sewerage network	Sharkhad area main collector of sewer with D400 and D800 mm installed at the south of outside of the project site	Tolgoit area main collector (D 500 mm) is installed at 800 m away from the border of the project site	Chapter III, Section B-3	
Heating supply network	Amgalan Heating plant, which is about 700 m away from the project subcenter	No.4 Heating Plant is 600m away from the Togoit subcenter	Chapter III, Section B-4	Heating Distribution Network SOE (UBDN)
		500 mm ~ 700 mm heating pipe network was already constructed spanning through to the northern part of the subcenter		
Power supply network	7 existing small substations with 10 kV	Power substations of “Geo” and “RP-110” with total capacity of 100MW and 5 existing small substations with 10 kV	Chapter III, Section B-5	Power Distribution Network SOE
Telecommunication network	ATC-45 telecommunication station	ATC-63 telecommunication station	Chapter III, Section B-6	Communications and Information Technology Authority

5. Flood risk

444. The project design needs to ensure the existing drainage network, to which the new tertiary network will connect, is not flooded with silt and sediment from the upstream excavation and earthworks activities. Thus, the tertiary drainage ditch works should not be conducted during rainy periods, and drainage ditch work sites should be surrounded by silt berms and traps to keep the down-drainage areas clear.

445. The measures to be implemented to control flooding in the subcenters will be primarily construction of new tertiary drainage ditches that are connected to the existing natural drainage network.

Similar to the road works, the civil works activities will create disturbances of erosion, dust, noise, and reduced movement and access. The same focused disturbance and impact mitigation measures must be applied. Tranche 3 will stabilize the slopes of the existing ditches with concrete pads, and clear existing ditches of debris and garbage to return natural flow. Existing ditch drainage will be extended with construction of tertiary ditches to allow movement of more water out of the micro-basins, and where ponding currently occurs during rainfall events. During construction protection of disabled persons will occur as it will occur for all new road and sidewalk developments. There are no associated facilities.

446. Integrated with the design of the flood control measures is consideration of climate change in the region. Specifically, changes to average seasonal rainfall, and more importantly, the change in the frequency and severity of rainfall events.

B. Impacts and mitigation measures during construction stage

The project activities during construction phase will involve construction of heating, water supply and sewerage pipelines, construction of roads and buildings, which will involve excavation, concreting, asphalt pavement works, digging drainages, civil works and erection of equipment, clearing of area and restoring topsoil. During the operation phase, most of the construction phase impacts will get stabilized and the impacts will be restricted only to the operation and maintenance of the project facilities.

1. Impacts on physical and environmental resources

iii. Topography

Impact

447. During the construction period, the most prominent impact on the surface topography will be due to the excavation for foundations, digging channels for pipelines, drainage works and erection of buildings.

448. The construction phase involves site preparation, clearing of existing vegetation and some earthworks for leveling the surface. These activities may cause some negative impacts such as:

(i) Change in Landscape;
(ii) Emission of Dust;
(iii) Associated noise; and
(iv) Improper management of construction debris and solid waste may pose risk to the neighbors.

Mitigation

449. Proper EMP measures will be implemented by the Contractor. Further sections discuss the above impacts in greater detail.

iv. Climate

Impact

450. Design and construction of road, pipelines and buildings should consider 'climate proofing design' for subproject facilities. Alternative solutions and final designs should be subject to expert and community consultation and must analyses flood risk and drainage design to accommodate surface water runoff to greenfield rate at least 1 in 100-year flood plus climate change allowance if feasible.

Mitigation

All facilities shall be properly sited to minimize the risk of scouring that may result from increased rainfall as a result of climate change. However, the overall project impact on the climate conditions will not be significant.

v. Air Quality

Impact

451. During the construction phase, the activity would involve excavation for the erection, movement of transporting vehicles carrying the construction materials etc. along the access road. All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the sites. Though the emissions are temporary in nature and not expected to contribute significantly to the ambient air quality and will be within prescribed limits for urban areas by national ambient air quality standards, necessary measures are to be taken.

452. As shown in the Table 73 and Table 74, the measured dust concentration levels (both Particulate Matter 10 and Particulate Matter 2.5) in both subcenters significantly exceed the standard level required by the national air quality standard and WHO guidelines in every month of the year. Air pollution is one the biggest environmental issue for all parts of the Ulaanbaatar city. Construction activities might contribute to the already severely polluted air quality condition in the subcenters by generating more dust. Thus, it is important for the project to have an effective dust management plan to ensure the potential negative impact on air quality is minimized. Dust generation will potentially negatively affect the following receptors:

(i) Nearby households and residents and general public;
(ii) Nearby automobile market vendors and maintenance workshop workers;
(iii) Nearby apartment dwellers and other buildings in the vicinity; and
(iv) Construction workers.

453. The main sources of dust generation during the construction are:

(i) Earthwork sites including trench digging sites for the utility pipelines, road construction sites and foundation sites for the social buildings;
(ii) Construction trucks that transport earth materials;
(iii) Concrete trucks that transport concrete; and
(iv) Construction sites where concrete pavement, cutting, filling and other activities cause generation of dust.

Mitigation

454. During dry and windy days when it's not raining and dust level goes up, regular sprinkling of water is recommended with norm of 2-4 liters per square meter at the dust source points 3-4 times a day.

455. Soil stockpiles and inert material piles at the active earthwork sites, including trench digging sites for utility pipelines, road construction sites and foundation work sites for the social buildings, shall be covered in order to prevent from dust spread.

456. Loaders of the construction trucks that transport earth materials, concrete materials shall be covered with tarpaulin in order to prevent dust spread when driving through the settlement areas. Concrete trucks with mixing loader shall be washed out or cleaned their loaders and wheels when leaving mixing plants.

457. Conduct regular site cleaning at the construction and storage sites where there might be fine dust particles, concrete crumbles and wood crumbles that might spread through the air with wind blows.

458. Construction works, particularly concrete pavement, trenches diggings and other earthworks, shall be stopped temporarily during windy days.

459. The construction company shall ensure proper dust management is done to reduce impact due to site construction dust. The Construction company shall evaluate the volume of earthworks, and must monitor dust level within 500m using appropriate equipment and ensure comprehensive dust mitigation plan developed.

460. Conduct regular technical inspection to ensure all construction vehicles are in good condition technically and emission rates are within the standard level.

461. Monthly air quality monitoring shall be made to ensure dust level does not exceed the allowed levels. In case of non-compliance to the air quality requirements, a corrective action plan must be developed. PMO and the external monitoring team will have weekly inspection on the contractors performance on implementation of the mitigation measures.

vi. Noise Level

Impact

462. During the construction phase, the major sources of noise emission from movement of vehicles transporting the construction material and equipment within and outside the construction site. The major work of the construction is expected to be carried out during the day time, thus residents living nearby will be exposed to noise generated during daytime during the construction phase.

Mitigation

463. Contractor shall equip their heavy construction equipment and plants with exhaust silencers to limit the engine noise not to exceed 60 dB (A) during daytime and 45 dB during night time (compacters/rollers, loaders and cranes) and regularly maintain all construction vehicles and machinery that should meet the Mongolian national standards for noise emission.

464. Contractor shall preferably limit working time for activities that create noise within normal waking hours of the public except for construction site near public sensitive receptors. There will be no construction work allowed in during night. Construction related activities closer to sensitive receptors have to be scheduled in coordination with the residents and relevant khoroo authorities.

465. Contractor and its suppliers of construction materials should strictly implement noise control regulations stipulated for Noise pollution for all construction vehicles and equipment. All machines will be fitted with noise reduction devices. Ulaanbaatar has many construction sites, some of which operate 24 hours a day. Mongolian standards currently establish a maximum environmental noise goal for residential receptors of 60 decibels (A-weighted) (dB(A)) during the daytime and 45 dB(A) during the night time, with night being defined as between 22:00-06:00 hours (MNS 4585:2016). World Bank EHS Guidelines 2007 for noise limits will apply as they are more stringent than the Mongolian noise standards. The corresponding level of noise parameter for daytime is 55 dB. During the night, it is necessary to prohibit noisy activities.

466. For managing noise nuisance, construction works should be limited to daytime hours and all employees likely to be exposed to ear noise must use ear protectors. However, the noise impacts will be local limited to the premises and very short term. Loud noise may disturb the local resident apartment dwellers during normal hours of waking as well. Due consideration must be given by the Construction Company in consultation with local residents. Noise barriers may be installed by the Construction Company to ensure residents are not inconvenienced.

467. The Construction company will install noise barriers during construction if the residents complain of higher noise incidence from construction activities.

vii. Surface Water Quality

Impact

468. The project activities and facilities both during the construction and operation phases will not have any major impact on the surface and ground water quality in the area. Contamination of water bodies outside of the project areas (such as Uliastai river which flows in 300m distance outside of the project area), may result due to oil spills and surface runoff from the construction site adjoining the water body. There may be increase in the turbidity levels temporarily where the surface runoff during construction meets the drainage of the area. This can be avoided by careful selection of the raw material and waste material storage at the construction site.

469. Proposed activities will create temporary impacts to the existing drainage system in the area. Thus, it will create temporary inundation closer to the above locations during rainy season. Stagnation of water will create direct impact on public health.

Mitigation

470. The Construction company shall prepare and implement Spill Management Plan which shall include necessary measures to avoid from oil spills from construction vehicles and machineries, and neutralizing measures in case of oil spill occurs.

471. Incorporation of following measures will minimize anticipated impact due to obstruction of natural flow paths and existing drainage:

(i) Provisions of temporary drainage facilities to the particular locations if existing drains are obstructed due to construction activities.
(ii) Maintenance of all drainage paths by avoiding blockages at all times.
(iii) Adequate reinforcement of embankment will be done to ensure no surface runoff gets discharged into the water body/river.

472. Care shall be taken to locate the temporary construction sheds away from the drainage/water bodies. Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of the construction workers should be provided to avoid the surface water pollution. Provision of adequate washing and toilet facilities should be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

viii. Ground Water Quality

Impact

473. Ground water pollution can take place, if chemical substances and oily waste get leached by precipitation of water and percolate to the ground water table. The silt discharge from the earth work around water bodies, oil, grease and fuel release from the construction vehicles / equipment and spoil from construction and other construction related activities such as raw sewerage from worker accommodation sites will mix with runoff water. This situation will increase during the rainy season and have a critical impact on surface and ground water. No impact on ground water quality is anticipated if the Construction company implements the EMP measures properly.

Mitigation

474. Special attention shall be paid to the existing wells within the ger areas that are main source of drinking water for the residents in the subcenters during the construction period.

475. The construction company must ensure that drinking water procured from ground water wells in the ger areas must meet national drinking water standards and must be regularly tested in conformance to the national drinking water standards.

476. Since most of the labor in UB city will stay at their homes, there is no construction labor camp.

477. The construction company must develop Spill management plan to ensure that all fuel, oil, chemical is stored in 100% bundled area with impermeable floor, everything correctly labeled etc. They must refuel vehicles (if any) only in designated areas and must have spill kits on site to clean any spills at once and remove contaminated soil18F18F18F19 etc. to avoid contamination of ground water.

478. Following measures will be required in order to prevent deterioration of water from the construction and construction related activities:

(i) All construction vehicles and equipment should be maintained in proper conditions without any leakages;
(ii) Contractors shall use silt traps and erosion control measures where the construction is carried out in close proximity to the water bodies to avoid entering of cement particles, rock, rubbles and wastewater to the surrounding drains;
(iii) Construction activities requiring digging should be preferably done in the dry season; and
(iv) Waste oil should be collected properly and disposed to the approved location.

ix. Soil and Geology

[19] Refer to EHS guidelines on Construction and Demolition.

Impact

479. Project activities including excavation, cut and fill operations will enhance the soil erosion during the rainy season. The excavation activity and land clearance in the erosion prone areas shall be minimized. Leveling and stabilization of construction sites will be done after completion of construction activity. Also, increased acceleration of surface runoff will damage the topsoil.

480. Construction company must develop a drainage and earthwork management plan to limit erosion, runoff, etc. pursuant to Mongolian standards and/or best international practices depending on whichever is more stringent.

Mitigation

481. The impacts associated with excessive erosion and other civil works can be avoided or minimized by following mitigation measures:

(i) Minimize obstruction or destruction to natural drainage pattern of the surrounding area.
(ii) Proper treatment of clearing and filling areas against flow acceleration.
(iii) Contractors shall restrict cut and fill operation around sharp/deep slope areas.
(iv) Topsoil which are removed during construction must be stored separately for future utilization.

482. There is no national wildlife park, bird sanctuary, wetland in the location of the subprojects. The closest protected area – Bogdkhan Mount SPA is located in 3.2 km distance from the Sharkhad subcenter and in 3.5km distance from the Tolgoit subcenter, respectively. Other national parks around Ulaanbaatar area are Chingeltei mount SPA (14 km from the subcenters) and Terelj-Gorkhi national park (55km from the subcenters). Given the distance from the protected areas and national parks, no impacts are anticipated.

2. Impacts on ecological resources

i. Impact on flora and fauna

Impact

483. Since the Tranche 3 subcenters are densely populated settlement areas where there are no green areas and wildlife habitat, no impacts on ecological resources are anticipated. No protected plant and animal species registered on IUCN red list exist in the vicinity of the Tranche 3 subcenters.

484. No wildlife habitats are located in the vicinity of the subcenters. National Park or Nature Protection Areas near Ulaanbaatar and other provinces which are around 6-50 km away from the subcenters.

ii. Aquatic ecology

485. There are no major rivers or tributaries in the location of subprojects. No significant impacts on aquatic ecology of the river are envisaged and will not have any impact due to subproject activities.

486. There is no sensitive ecological area / protected forest area such as national wildlife park, bird sanctuary crossing the Tranche 3 subcenters.

3. Impact on human environment

i. Local road network

Impact

487. Iron bars, concrete materials, digging equipment, etc. will be transported through the local road network to the project site. Transporting of large quantities of materials using heavy vehicles could exceed the carrying capacity of the road. This would lead to physical damages to local road network. Thus, it will be necessary to obtain consent from the road/highway authorities to use local/national highway roads prior to transportation. The construction company will conduct a pre-reconnaissance survey of road condition to ensure that no structure would be damaged by vibrations, etc., to avoid future claims from the road department. The construction company must develop traffic management plan to minimize road safety risks, as hospitals need to consider how sick, elderly, disabled will be able to safely enter/egress site as part of the design process.

Mitigation

488. Construction vehicles shall be required and inspected not to overload for transportation of materials. The Construction Company should properly maintain all road sections, install road signs warning of patients, pedestrian crossing, etc., which will be utilized for the construction related activities. The Construction company will ensure free and safe access roads and crossings for local residents wherever necessary during the construction period and install appropriate road safety signs as necessary in the area.

ii. Disposal of debris

Impact

489. As a result of construction related activities, spoil and debris will be generated during the construction stage. Improper disposal of the debris will have an impact on the surrounding ecology, public health and scenic beauty.

Mitigation

490. Following measures will minimize the impacts associated with disposal of debris:

(i) Spoil materials (soil, sand, rock, etc.) generated from construction activities shall be used wherever possible for site leveling, back-filling etc. Any dismantled and demolished structural materials, if any, should be dumped in accordance to government norms or international best practices whichever are more stringent;

(ii) Preparation of Disposal Management Plan for the project and selection of the disposal site by excluding locations, which are closer to residential, commercial and public sensitive areas, is necessary by the construction company. Prior approval should be obtained for linked facilities such dumping grounds / land fill sites from relevant local authorities if currently all existing sanitary landfill sites are to be used;

(iii) Dumped materials may interfere with the drainage pattern of the area, marshlands or important public spaces such as playground etc., if not planned properly. Therefore, care must be taken that proper silt traps are developed at the site to ensure no dumped material flows into the drains; and
(iv) During operation phase, there is no requirement for disposal of debris.

iii. Traffic Safety

Impact

491. During the construction phase, traffic disturbance needs to be minimized by avoiding heavy traffic hours, ensuring proper access roads and avoiding road blockage. Increase in vehicular traffic in the area is likely to occur during construction phase because of trucks ferrying in off construction material and carrying waste material from site. Following are the impacts likely to occur due to increased traffic:

(i) Slightly more congestion at the main public roads in the subcenters and nearby active construction sites;
(ii) Increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads;
(iii) Pedestrians and cyclists using local roads will have to exercise more care with increase of vehicular traffic on the said roads;
(iv) There will be an increase of exhaust emission from vehicles, which will slightly increase the local atmospheric air which is already polluted severely due to high density of traffic and coal burning by households; and
(v) Constant movement of vehicles that transport construction materials will cause increased level of dust and noise during the construction period.

Mitigation

492. Effective traffic safety procedures and accident management plan needs to be implemented. All the vehicle drivers must have attended periodic induction trainings on traffic safety before start of every construction season. Speed limit rules will be enforced for all construction vehicles in order to minimize traffic accident risks.

493. The Construction Company may have to carry the construction material into the site at night or during least congestion period. So, the traffic related congestion and air pollution would be least affected in this case.

iv. Worker Health and Safety

Impact

494. Health and safety impacts will be in terms of risk of accidents and exposure to electric shock at the construction site. In addition, when construction work takes place in a public environment, safety measures are often lacking to protect the public. Project activities may create accidental damage to general public and the construction workers.

495. The objective of occupational health and safety is to provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. It also covers the establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not

possible, to minimize, adverse impacts and risks to the health and safety of local communities. It is therefore a combination of occupational health and safety of staff/workers at the subproject facilities and community health and safety of people living nearby or potentially affected by failures or poor operation of facilities.

Mitigation

496. The Construction company will undertake Health and safety risk assessment that would include measures of EHS Guidelines on occupational health and safety (OHS) and community health and safety (CHS) to avoid, minimize, mitigate for residual risk. Necessary training regarding safety aspects to the construction workforce will be provided by the construction company. The workers should wear personal protective equipment, safety goggles, and other necessaries during construction period and during the maintenance work. First aid facilities will be made available with the labor gangs and doctors called in from nearby primary health centers when necessary. Article 16 of the National Constitution of Mongolia states that every employee has the right to 'suitable conditions of work'. The government adopted a National Program for Occupational Safety and Health Improvement in 2001 and national standards are also adopted such as the National Standard on Occupational Health and Safety (MNS 5002:2000).

497. Construction Company should take necessary action to enhance personal safety during the construction through following measures:

(i) Organize awareness programs relevant to personal safety of the workers and general public in the subcenters;
(ii) Installation of warning signs to particular locations such as active construction sites and nearby road crossings and buildings;
(iii) Provide protective safety belts, footwear, helmets, goggles, eye-shields and clothes to workers depending on their duty;
(iv) Arrangement of proper first aid unit and transport facilities to take injured people to the hospitals;
(v) Health and safety issues due to construction activities could be an issue for workers and local community. Accident can happen occur during earth cutting, casting, construction works and installation of heavy machinery if care is not taken in their operation. Any near miss, minor, lost time, fatal incident to be reported within 24 hours of incident with corrective action plan to avoid repeat accidents; and
(vi) The active construction sites will have to be fenced off and marked, so as to prevent the access of pedestrian passengers to the construction site. When land clearing is complete, the work area is finished, and facilities are in place, all of the above impacts and risks will be neutralized.

498. During construction, the PMO will engage in public consultations and EMP trainings to improve worker and community members' knowledge, attitudes and practices on health and safety.

499. The occupational health and safety risks will be managed by applying measures in the following order of preference: avoiding, controlling, minimizing hazards, and providing adequate protective equipment. All workers will undergo a site induction/orientation that will highlight expectations on minimizing impacts to the physical and social environment. There will be an on-site and off-site code of conduct established that will outline roles, responsibilities and consequences for non-compliance. Prior to construction, the site-specific Environmental Management Plan will be finalized to include the following components:

(i) Public health management plan;
(ii) Waste and hazardous material management;
(iii) Worker accommodation management (if there are workers' camps);
(iv) Traffic safety management component during construction;
(v) Dust, noise and vibration management; and
(vi) Occupational health and safety management.

500. In addition, each contractor's Site-Specific Environmental Management Plan will include measures for health and safety for personnel. Contractor should be required to employ at least one dedicated Health and Safety (H&S) supervisor per site. The plan will be submitted to the PMO for review and appraisal and will include the following provisions for health and safety:

(i) Personal protection. Provide personal protective equipment appropriate to the job, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers.
(ii) Worker accommodation plan. Which will conform to International worker accommodation standards to prevent health, safety, security and environmental risks to workers and community members alike.
(iii) Emergency preparedness and response. An emergency response plan to take actions on accidents and emergencies, including environmental and public health emergencies associated with hazardous material spills and similar events will be prepared, and submitted to the PIU for review and appraisal. A fully equipped first-aid base in each construction site will be provided.
(iv) Records management. A Records Management System will be established to document occupational accidents, diseases, and incidents, that: (a) includes a tracking system to ensure that incidents are followed-up; (b) can easily retrieve records; and (c) can be used during compliance monitoring and audits. The system will be backed up on at least one external hard drive to protect records against loss or damage.
(v) Safety communication. Ensure that safety, rescue and industrial health matters are given a high degree of publicity to all persons regularly or occasionally on the site. Posters drawing attention to site safety, rescue and industrial health regulations will be made or obtained from the appropriate sources and will be displayed prominently in relevant areas of the site.
(vi) Training, awareness and competence. Train all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work. The Contractor must have no tolerance policy on workers on following H&S requirements and must incentivize workers for maintaining good H&S record.

v. Community health and safety

Impact

501. Health and safety issues due to construction activities will be an issue for workers, community and others. Accident can occur during earth cutting, casting, construction works and installation of heavy machinery if care is not taken in their operation.

502. Risks to community health and safety (CHS) and occupational health and safety (OHS) are of highest priority during the construction stage as project activities can affect various environmental, social and behavioral determinants of health. Risks to CHS and OHS can be inter-related, as interactions between construction workers and local community members are unavoidable.

503. The increase in construction traffic, especially of heavy goods vehicles, along the local road networks will affect road safety and the risk of road traffic accidents and injuries. This risk is higher for pedestrians and near vulnerable receptors such as schools and other social services. Construction traffic and construction works on the various sites will generate noise. Construction-related day-time noise, as well as annoyance and other health effects in the general population around the various construction sites. Night-time noise associated with night-time construction traffic and offloading can cause sleep disturbance and therefore will be limited and as per agreement with local community.

504. Other notable workplace safety concerns include: (i) construction activity which takes place without warning board signs and safety barriers; (ii) trenches dug next to pedestrian path without fences; (iii) piled pipelines that pose danger of falling next to playground; (iv) and failure to provide safe access for pedestrians nearby construction sites.

Mitigation

505. The construction company shall have internal safety regulations during the construction period. Mitigation measures can address community health and safety risks and impacts associate with increased air pollution, noise and traffic during the construction phase.

506. All construction sites including trench digging sites, utility pipeline construction sites, road construction sites, social building construction sites and other earthwork sites will have to be fenced off and marked, so as to prevent the access of local community, in particular residents and children in the vicinity of construction sites.

507. A safe pedestrian pathways and access roads must be provided at and around construction sites and wherever necessary.

508. Any activities that require temporary use of land, such as storing of construction materials, placement of equipment and parking of construction vehicles, shall be selected carefully to avoid children playground, kindergarten, middle school, water distribution kiosks and primary health center.

509. The construction company must focus the traffic safety awareness campaigns to communities that lives and communes along transportation corridors, imposing speed limitations with zero tolerance clauses in the worker codes of conduct for non-compliance, traffic signs on entry and exit points of the construction site, signs of caution about movement of transportation machinery.

510. Enforcement of safety rules and implementation of the prevention measures through periodic monitoring of safety performance of the contractors by PMO, supervision engineers and external monitoring team during the pre-construction and construction phases. Any non-compliance or poor performance by the contractor will result to a corrective action plan and penalty.

vi. Sanitation hazard and drinking water

Impact

511. The health of the project personnel, construction workers and laborer at the site could be impacted if arrangement of sanitation and drinking water is not ensured adequately and properly. Presence of construction workforce in the project area during the construction period and water consumption for construction and drinking purposes might cause higher demand on the local utilities and service facilities particularly at the water distribution kiosks.

Mitigation

512. Most construction workers will be local residents of Ulaanbaatar city, thus will stay at construction sites only during the daytime. But some of the workers might come from other regions and may stay in nearby accommodation planned by the Contractor. The increased demand for water for construction and drinking purposes (drinking for construction workforce) shall be consulted with the relevant authorities, communities and according to the results derived, the contractor shall carry out the necessary action and find, secure the water. Regular testing of drinking water as specified in the EMoP is compulsory. The Contractor to develop occupation health and safety plan for those workers from other regions as per EMP.

vii. Emergency response during construction

513. The Construction Company must train its project personnel, construction workers and laborers, and staff to have knowledge of sufficient emergency response systems put in place. Fire safety management training and mock drill should be practiced periodically and emergency equipment and facilities like fire extinguisher/water hose, first aid etc. must be available to manage fire hazard or any medical emergency.

514. There are no archaeological, historical or cultural important sites in the vicinity of the subcenters; hence no impacts are anticipated on cultural heritages.

Solid waste disposal

Impact

515. The solid waste generation will be at the location of the construction site which will include metal scraps, wooden packing material etc.

Mitigation

516. Wooden waste and metal scrap will be collected and disposed of in compliance with applicable regulations and rules.

Liquid waste disposal

517. The construction company must develop pollution prevention plan to ensure that all fuel, oil, chemical is stored in 100% bundled area with impermeable floor. If there is any generation of liquid waste, the construction company shall arrange to handle it as per Mongolian law or best practice international practices (whichever is more stringent).

Hazardous waste disposal

518. Any hazardous waste generation is not expected. Inert (non-infectious) hazardous waste material such as batteries, and solar panels (if used) would need to be disposed of as per Mongolian law. The contractor will transfer and dispose of the such hazardous waste to a suitable place to Mongolia, then the Contractor will dispose it to such a location. Otherwise, this lined site will be refilled with waste and used until it is completely filled. Once it is filled, the pit shall be sealed to protect leakage (leaching through pores in concrete to the ground) of the contaminant.

C. Impacts and mitigation measures during operational stage

519. The main concerns related to operation of the new are increased vehicle accidents, and increased GHG production. The former can be addressed with enforced, clearly marked speed limits. Increased GHG production from increased vehicle traffic can be managed with reduced speed limits, and legislated requirements for vehicles which use the road to be in good working condition.

1. Water supply and sewerage networks

520. The operational issues concern failure of the pipelines leading to leakage or mass spills. A regular inspection and maintenance program must be developed and administered by USUG for the new water supply and sewerage network to ensure sustainability of the networks.

2. Heated water supply

521. Similar to water supply and sewerage, the potential operational issues concern failure and rupture of a pipeline at, or between the 20+ heating line substations in the subcenters. A regular inspection and maintenance program must be developed and administered.

3. Health care waste management

Impact

522. According to WHO,[20] around 15% of health care waste (HCW) is considered hazardous material that may be infectious, toxic or radioactive. Inadequate HCW management can cause environmental pollution, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from syringes and needles contaminated with human waste.

(i) Solid Waste. Operation of the primary health center (PHC) building at Tolgoit will result in production of solid waste, which will require careful storage, separation and handling; and
(ii) Disposal of medical solid waste. The primary health center will generate hazardous, infectious and chemical waste during their operations that can be managed properly following to EMP.

Mitigation

523. Solid waste. Properly marked waste containers should be available at each floor and outside the building. All solid waste will be segregated properly, disposed to the safe places carefully. The PMO will provide training on solid waste management to both staff/patients to segregate waste by placing separate containers stating waste type before being collected by the Urban service agency of Songinokhairkhan district. Sweeping and washing should be done to provide patients a waste free healthy environment. It is important that solid waste and sewage from the PHC building should not be nuisance to the community.

524. Disposal of medical solid waste. Medical waste such as syringes, bandages, etc. are collected on regular intervals by Element LLC is the sole licensee having obtained special license on handling medical

[20] 2013. Health Care Waste Management in Mongolia. World Health Organization.

waste from the Ministry of Health to collect medical waste in Mongolia. They have a medical waste facility at Ulaanbaatar city's central dumpsite called Narangiin Enger. Management of medical waste by the PHC will strictly follow the "Regulation on classifying, collecting, storing, transporting, recycling and disposing of hazardous medical waste" which was adopted with Order No. A/505 of Minister of Health, December 2017.

D. Cumulative impact analysis

525. No other construction or industrial projects are identified within the Sharkhad and Tolgoit subcenters.

526. During construction phase of the Tranche 3, various civil works activities are required for the diverse array of subcomponents simultaneously which could compound construction disturbances on residents and entities in the subcenters. The potential cumulative impacts and disturbances from simultaneous construction will be avoided with careful planning and scheduling among the contractors as coordinated by the PMO engineers during the pre-construction phase. This will also act to prevent unnecessary extra cost and repeated excavations.

527. After construction phase is completed for all subcomponents, potential induced spatial and temporal cumulative impacts of Tranche 3 would stem from the new roads and the increased access, and movement within the subcenters. The increased traffic could increase risk of traffic accidents, injury, and expense. Increased outsider access and traffic to the subcenters could increase commercial development pressure in the area. Traffic Control Department of MUB will be responsible for traffic management which will aim to prevent from traffic accidents by imposing traffic rules strictly and by providing sufficient traffic sign boards.

528. Construction material transportation by the civil works contractors to the construction sites in Sharkhad area will contribute to the existing traffic congestion issue in the area which is mainly caused by the Sharkhad automobile market. Thousands of people visit the automobile marker on daily basis to buy/sell their cars. This cumulative traffic congestion impact can be minimized through smart transportation planning. Traffic congestion is far less intense every Monday because the Sharkhad automobile market is closed every Monday. Transportation of construction materials to the construction sites shall be planned on Monday, so that the cumulative traffic congestion impact will be minimized.

529. The ultimate goal is that businesses and households in the ger areas enjoy the benefit of connection to the centralized water supply and sewerage networks. However, that dependence could become a negative issue if there are future failures or major disruptions of water supply, sewerage, or sewage treatment. Such events would cause major disruptions to normal household and business activities. Back-up system provisions must be built into the centralized designs to be able to manage such situations.

E. Climate change

530. Impact of climate change as primarily defined by increases in the frequency and severity of rainfall and wind events. Climate modelling for Mongolia is projecting changes which include increased air temperatures, increased precipitation in some areas and a reduction of water resources in other areas. [21]

[21] United Nations Environment Program (2009) Mongolia: Assessment Report on Climate Change 2009.

Potential evapo-transpiration increase would be higher than precipitation increase. This is supported by Mongolia's Second National Communication on Climate Change. [22] Potential evapo-transpiration increase would be higher than precipitation amount increase. Future climate changes are expected to negatively impact Mongolia, mostly in the agricultural and livestock sectors. This in turn will affect the society and economy, meaning climate change adaptation is a significant issue for the country.

531. The Consultant team has conducted a climate change risk screening in June 2019. The risk rating was identified to be medium, and no significant impacts on the project are expected. The screening identified (i) More frequent extreme low temperature events (e.g., dzuds days) in the future as a major risk affecting project design, construction, maintenance and performance. Low temperature and annual temperature difference, which will cause structure deformation and low cement solidification. (ii) More frequent flooding and heavy rainfall as a major risk (iii) More frequent lack of precipitation/drought as a minor risk. Mitigation measures to address various climate change related vulnerabilities will be considered during the detailed design stage.

532. Similar to Tranches 1 and 2, the design of the subcomponents of Tranche 3 will include explicit consideration of the design of the components, in particular flood control measures, road grades, and water supply and sewerage embody the projected climate change for the region. Consideration of climate change includes measures to reduce the contribution of the rehabilitated roads to greenhouse gas production. Effort needs to be taken to reduce the carbon footprint of the roads by ensuring that posted speed limits along the roads are enforced, and that all vehicles using the roads are in good working condition. All lighting installed along the roads should use light bulbs that are energy efficient.

F. Summary of impacts

533. Table 87 provides a summary analysis of positive and adverse impacts of the Tranche 3.

Table 87. Summary Analysis of Positive and Adverse Impacts

1	Project Activities	Positive Impacts (Type)
A	**Construction**	
i	Employment	Employment opportunity to local population. (Temporary)
B	**Operation**	
i	Socio-economic impact	Households and businesses in the subcenters will be connected to centralized water supply heating and sewage pipelines and provided with improved waste management facilities and road networks that will help to improve quality of life for the local community. Reduced use of coal burning stoves and open toilet pits will help to improve air quality and soil quality.
2	**Project Activities**	**Adverse Impacts (Type)**
A	**Pre-Construction phase**	
i	Land acquisition	Resettlement will be required for the new roads, and some of the new buildings and the new social service facilities. A detailed LARP was prepared for Tranche 3. Affected households will be consulted, surveyed, negotiated and resettled in proper manned following to the ADB SPS Guidelines and relevant domestic regulations.

[22] MNET (2010) Mongolia's Second National Communication on Climate Change; Under the United Nations Framework Convention on Climate Change (UNFCCC).

ii	Temporary use of land	The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites
iii	Type and scale of insulation of pipelines	The design must lead to introduction of energy efficiency elements and conforms to national standard requirements.
iv	Flood risks	The project design must ensure the existing drainage network, to which the new tertiary network will connect, is not flooded with silt and sediment from the upstream excavation and earthworks activities.
v	Linked facilities	The PMO must confirm from concerned authorities of various linked and facilities such as landfills to accept solid waste, underground utilities such as heating pipes, sewage drainage, water pipeline etc. The detailed design and supervision consultant under PMO shall do the due diligence from design stage to construction stage.
B	**Construction phase**	
i	Influx of workers	Health and safety of workers at site may pose risks; concentration of labor force creates un-hygienic condition and sanitation hazard (Temporary).
ii	Construction of buildings, facilities and pipelines	Equipment installations may create noise; carrying of construction materials may create traffic congestion; cutting/filling, stockpiling of construction material and traffic movement may create dust emission, improper management of construction debris and solid waste may pose risk to the workers, nearby businesses and residents (Temporary).
iii	Transportation and traffic	More congestion near construction sites; increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads; pedestrians to exercise care with increase of vehicular traffic on the adjacent roads and increase of exhaust emission from vehicles (Temporary).
iv	Waste generation	Domestic and construction waste (including inert materials) will be generated during the construction period.
C	**Operation phase**	
i	Improved roads	Improved/expanded and new roads might lead to increased vehicle accidents, and increased GHG production
ii	Water supply and sewerage networks	Connection to the centralized water supply and wastewater might lead to increased water consumption and wastewater generation in the project areas. Concern failure of the pipelines leading to leakage or mass spills.
iii	Heated water supply	Concern failure and rupture of a pipeline at, or between the 20+ heating line substations in the subcenters
iv	Waste generation	Medical waste will be generated from the primary health center during its operation.

Table 88. Summary of Adverse Impacts on Key Environmental Parameters

#	Environmental and social parameters	Impact Degree	Reason	Proposed Mitigation Measures
1	Air Quality	Medium	Dust emission from the construction activity and emission of air pollutants from vehicles transporting construction material at site	Regular sprinkling of water, proper handling of excavated soil, construction material, banned substances/VOCs etc.
2	Water Quality	Low	The project will require small quantity of water for construction. No hazardous effluent is envisaged to be discharged during construction	The required water will be sourced from tankers by the construction company or from nearby wells in the subcenters.
3	Soil quality	Low	Soil erosion due to movement of construction trucks and soil pollution due to oil spills	Construction company will implement Spill management plan and affected land sites will be restored at the end of construction period.
4	Physical environment	Medium	The construction activity may lead to noise pollution during concreting –steel cutting, bending, casting using vibrators, operation of mechanized equipment and drills etc., that will affect the local community. Generation of domestic and construction waste during the construction period and generation of medical and domestic waste during the operation might cause physical pollution and harm to human health if not handled appropriately.	Noise monitoring will be done at regular intervals. If any night construction activity that is noise intensive is undertaken, staff and neighborhood must be consulted to determine suitable timings. Construction activities will be stopped during night time between 8:00 PM–08:00 AM. The construction company will implement Waste management plan during the construction period. Designated waste collection and disposal points will be appointed and waste transportation agreements will be signed with district urban service agencies. The PHC will sign medical was transportation and disposal agreement with licensed local firm – Element LLC. Operational entities will sign waste transportation agreements with their respective district urban service agencies.
5	Biodiversity	None	There are no forests, wildlife habitat, or protected species in the vicinity of the project areas. The project areas already are densely populated settlement areas.	None
6	Protected areas	None	There are no protected areas in the vicinity of the project areas.	None
7	Community health and safety	Medium	Increased movement of construction vehicles transporting construction materials, earthworks and other construction activities might lead to community health and safety concerns including traffic and pedestrian safety concerns. Suitable construction timing which aims to reduce disturbance on local communities.	The construction company will mitigate community health and safety impacts and risks following to EMP measures. All construction workforce including drivers will be trained in prior to commencement of construction works. A Traffic Safety Plan will also be implemented by the construction company. Safe access to households, safe pedestrian pathways will be provided around the construction sites. MUB Traffic Department will ensure traffic safety in the subcenters through installation of traffic signs, speed bumps and operation of traffic police.

#	Environmental and social parameters	Impact Degree	Reason	Proposed Mitigation Measures
				Operational entities will have H&S plan to remove accidental injury risks workers and communities such as electric shock.
8	Land use	High	Resettlement will be required for the new roads, and some of the new buildings and the new social service facilities	A detailed LARP was prepared for Tranche 3. Affected households will be consulted, surveyed, negotiated and resettled in proper manned following to the ADB SPS Guidelines and relevant domestic regulations.
9	Cultural heritage	None	There are no cultural heritages exist in the vicinity of the project areas.	None

VI. ANALYSIS OF ALTERNATIVES

534. Because the Tranche 3 is a continuation of Tranche 1 and Tranche 2 with similar sub-components, alternatives to Tranche 3 were minimal because the alternatives were essentially assessed within implementation of the previous tranches.

A. Without project alternative

535. The subcenters would continue embracing the following significant development challenges:

(i) Drinking water supply of local households and businesses in the subcenters continue reliance on local kiosks which restricts average water consumption per households;
(ii) Chronic health issues and major negative living aesthetics from reliance on pit latrines for sanitation, and exposure to associated contaminated soil and surface water;
(iii) Bad in-house and ambient air quality from reliance on burning coal and wood with homestead cooking stoves for heating;
(iv) Movement within, and access to/from ger areas restricted from extremely bad roads and sidewalks, and which is also dangerous in winter; and
(v) Insufficient access to schools, hospitals, recreation, and community social development centers.

B. With project alternative

536. The project will greatly improve the quality, standard of living, and health of the residents the ger subcenters, and at the same time significantly improve the quality of the local environment by reducing the hardships summarized above.

C. Location alternatives

537. Ulaanbaatar Urban Service and Ger Area Development Investment Program was initiated and being implemented in order to accomplish the main development goals set out in the “Updated General Development Plan 2020 for Ulaanbaatar city” and “Ulaanbaatar city Development Trend 2030”. The development plan aims to increase percentage of private houses in ger area that are connected to engineering pipelines (heating, water supply and sewerage) in total dwelling properties in the city from 0.3% in 2010 to 16.7% by 2030.

538. Secondly, the city population is too heavily centralized in the downtown area which makes it an overly crowded place prone to traffic congestion. The development policy is to decentralize the city by developing new district outside of the city and providing sufficient infrastructure for the ger areas.

539. To accomplish the abovementioned goals, 6 subcenters on the outskirts of UB city was chosen for the GADIP project. Thus, it can be assumed that locations for Tranche 3 subcenters were chosen with consideration of following key factors:

(i) Distance from downtown area (longer distance from the downtown area is preferred for the decentralization goal);
(ii) Current condition of infrastructure development (approximate to the centralized networks of heating, water supply and sewerage pipelines); and
(iii) Future plan for infrastructure expansion (the location of the selected subcenters can be favorable for expanding infrastructure to the remote areas behind them).

540. Both subcenters of Tranche 3 meets abovementioned location selection criterions. Sharkhad subcenter locates on eastern outskirts of UB city in 8-9 km distance from the downtown area and can serve as an infrastructure hub for the future expansion of the public roads and utility pipelines toward easternmost section of the city such as Uliastai and Gachuurt areas. Tolgoit subcenter locates on western outskirts of UB city in 11 km distance from the downtown area and can serve as an infrastructure hub for the future expansion of the public roads and utility pipelines toward westernmost section of the city such as Bayangol valley and Narangiin Enger areas.

541. Within development of design for the Sharkhad and Tolgoit subcenters which follows the UB city Master Plan 2030, selection of appropriate alignment for the roads and utility pipelines, the following points are taken into consideration:

(i) Alignment selection should consider seismicity and geography of the local area; the area should not be prone to landslide or be unstable;
(ii) Construction activities do not adversely affect the population living nearby the construction sites;
(iii) The location of the project facilities does not affect any monument of cultural or historical importance;
(iv) Resettlement of households is as minimized as possible, no loss of livelihoods, siting of key project facilities is away from sensitive receptors with due consultation with the community and local government units concerned;
(v) Construction techniques and machinery selection shall be made with a view to minimize ground disturbance;
(vi) While planning for new roads, buildings and utility pipelines, all underground infrastructure – drainage, sewage heating etc. shall be marked and to avoid seepage/leakages and pollution of water sources;
(vii) Construction Company to ensure that noise will not be a nuisance to neighboring properties. Provision of noise barriers near construction sites will be made if required;
(viii) Security fences will be erected around construction sites. Warning signs shall be displayed at site and road signs to be installed at appropriate locations;
(ix) PMO shall ensure that construction company must incorporate the best technical practices to deal with environmental issues in its working;

(x) Design of new buildings shall be made so as to include modern fire control systems/firewalls. Provision of fire-fighting equipment would be made at locations easily accessible, etc.;
(xi) Minimum cutting of trees and safety of people and property and favorable ground profile;
(xii) Avoidance of reserved forest, archaeological and other sensitive areas, animal or bird sanctuaries;
(xiii) Avoidance of rocky stretches and areas reserved for planned and future development, marshy low-lying areas, riverbeds and earth slip zones; and
(xiv) The construction drawings for design each facility must ensure no shadow of the proposed new buildings should fall on to adjoining buildings in keeping with building by-laws of the Mongolia.

D. Alternatives to heating source

Geothermal energy

542. At present, there is no identified geothermal resource in Mongolia for electricity (power) generation. There are some geothermal manifestation as hot spas. But, all hot spas situates in Khangai Mountain area. As concerns Ulaanbaatar, there is no geothermal manifestation. There is possibility in Mongolia to utilize low potential geothermal energy for space heating: use of hot spa and shallow ground heat.

543. Shallow depth ground heat utilization, which is called ground source heat pump (GSHP) started from 2008 in Mongolia. Traditional use of geothermal heat is health resorts such as Khujirt, Khuremt, Shargaljuut and Tsenkher, etc.

544. Several ground source heat pumps (GSHP) were installed in Mongolia.

545. Ground source heat pumps are installed in public buildings such as a school, dormitory and kindergarten located in the Tuv Aimag, which is 45 km southwest of the Ulaanbaatar capital city.

546. These ground source heat pumps are installed in the following buildings:

(i) Total of 1,120 m2 kindergarten building. Capacity of installed GSHP is 90 kW.
(ii) Total of 2,120 m2 school building. Capacity of installed GSHP is 90 kW and 76.8 kW.
(iii) Total of 600 m2 hospital building. Capacity of installed GSHP is 76.8 kW.

547. Also, there are three sites where installed GSHP - one small kindergarten and two private buildings in Ulaanbaatar.

548. Ground temperature measured by Takhilt Weather Station is given below as an example.

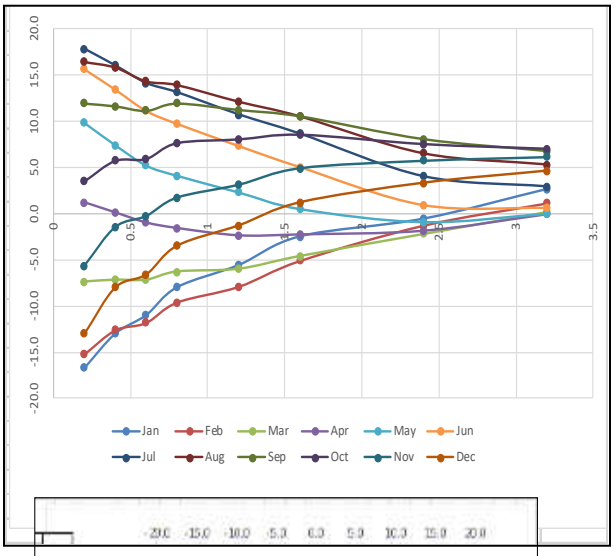
Table 89. Diagram of Ground Temperature of Takhilt, Ulaanbaatar

Month	Temperature at depth							
	0.2	0.4	0.6	0.8	1.2	1.6	2.4	3.2
Jan	-16.7	-13.0	-11.0	-8.0	-5.6	-2.5	-0.6	2.6
Feb	-15.2	-12.6	-11.8	-9.6	-7.9	-5.1	-1.3	1.1
Mar	-7.4	-7.2	-7.2	-6.3	-6.0	-4.6	-2.2	0.2

Month	Temperature at depth							
	0.2	0.4	0.6	0.8	1.2	1.6	2.4	3.2
Apr	1.2	0.1	-1.0	-1.6	-2.4	-2.3	-1.9	-0.1
May	9.8	7.4	5.2	4.1	2.3	0.5	-0.9	0.0
Jun	15.6	13.4	11.1	9.7	7.3	5.0	0.9	0.6
Jul	17.8	16.0	14.1	13.1	10.7	8.6	4.0	2.9
Aug	16.4	15.8	14.3	13.9	12.1	10.5	6.5	5.3
Sep	11.9	11.6	11.1	11.9	11.2	10.5	8.0	6.7
Oct	3.5	5.7	5.9	7.6	8.0	8.5	7.5	7.0
Nov	-5.7	-1.5	-0.3	1.7	3.1	4.9	5.7	6.1
Dec	-13.0	-8.0	-6.6	-3.5	-1.3	1.2	3.3	4.6

Source*: Geotechnical Condition of Mongolia by Dashjamts, J. Zulzagabaatar, 2009.*

Figure 83. Ground Temperature of Takhilt, Ulaanbaatar



549. In order to evaluate ground heat potential, boreholes must be drilled at least 120 m deep and its temperature measured, and also developed. Both of the Project Sites do not have geophysical survey and does not have information, regarding heat conductivity, heat content and rock types. Therefore, we do not have data required for ground heat source potential.

Other heating sources

550. Heating is necessary for life-support in Mongolia's cold climate, and systems must be highly reliable and affordable and should be implemented and operated in ways that minimize negative environmental impacts.

551. Coal is the predominant heating fuel in Mongolia, because it is abundant and less expensive than any alternative. There is also a well-developed distribution and supply infrastructure for coal, but the negative consequences of mining and burning coal require the consideration of alternatives. There are a number of potential alternative heating fuel as follows:

(i) Wood, which is used along with coal in stoves and small boilers, is undesirable because Mongolia has already over harvested their scarce timber resources;
(ii) Petroleum-based fuels such as diesel fuel are available but expensive. As concerns gaseous fuel, two companies have market and distribution infrastructure for liquefied gas (propane and butane) which are imported from Russia and mixture of these gases use primarily for cooking, and a small number of filling stations for motor vehicles that have been converted to operate by gas;
(iii) There are possibilities for natural gas to be imported from Russia on a larger scale as part of an international pipeline project involving China, but no specific projects have been proposed, and the importation of energy is not desirable when there are potential competitive alternatives in Mongolia;
(iv) There have been innumerable proposals in the past to provide alternatives to raw coal for use in small stoves and boilers, most involving processed and compressed coal, which have all failed to achieve significant market penetration; and
(v) Electricity is a common energy source for residential heating for those households located outside the coverage area of central district heating system who can afford the operating cost. Development in Ulaanbaatar has increased demands on the existing electrical generation and distribution infrastructure. So widespread implementation of electric heating is not a viable alternative, even if it could be made cost competitive with coal.

552. There are many efforts under way in Mongolia to provide alternatives to raw coal combustion for heating, but at the present there are none that are cost competitive or available with enough certainty to plan for their use in Tranche 3.

Table 90. Fuel Alternatives for Heating in the Subcenters

Fuel	Origin	Heating Value	Cost	Environmental Factors	Current Status
Coal	Mongolia	1.0	1.0	Impact of mining. Combustion emissions control requires improved equipment. CO2 emissions. Impact of ash disposal	Predominant energy source in Mongolia; Production and supply infrastructure exists.
Wood/ Biomass	Mongolia	1.0-1.5	2-4	Deforestation is already a significant problem, and agricultural by product biomass is needed to replenish soil nutrients. Lower emissions than coal.	Small stove and boiler technology improvements will reduce wood consumption. Wood briquettes made from sawdust are available, but in limited quantities. Preliminary studies for using agricultural biomass as fuel are underway.

Fuel	Origin	Heating Value	Cost	Environmental Factors	Current Status
Liquid Petroleum Gas (LPG)	Russia	3.3	17-23	Emissions impacts but less than raw coal; High transportation costs.	Bottled gas is popular for cooking and some vehicles are operated on LPG with a limited distribution infrastructure. No local sources in the foreseeable future, and there are no announced plans for improving delivery infrastructure.
Liquefied Natural Gas (LNG)	Russia	3.6	13-18	Emissions impacts but less than raw coal; High transportation costs.	There is no LNG infrastructure. Infrastructure for LNG in Mongolia (Liquefaction facilities, tank etc.) must be installed first.
Processed Coal	Mongolia	1-2	2	Lower emissions than raw coal in household stoves but no real advantage in large heating plants; Production requires energy input. Emissions from coking process.	Compressed coal “briquettes”, coked coal and other “smokeless” technologies are available in small quantities for home use in stoves.
Dimethyl Ether (DME)	Mongolia	2.0	1.03	Very low emissions but operational safety regulations are needed.	One project is in feasibility study phase and may have product available in 2018. Pricing may be competitive with raw coal, but new heating and cooking equipment will be needed. Other coal gas projects are only in pre-feasibility stage.
Shale Gas/Oil	Mongolia	3.3	n/a	Emissions impact similar to LPG when used. Extraction and processing require large amounts of water and has additional emissions impacts.	Large resources may exist in Mongolia, but projects are in pre-feasibility stage. One company is exploring for shale oil resources in Tuv Aimag.

Fuel	Origin	Heating Value	Cost	Environmental Factors	Current Status
Electricity	Mongolia	n/a	12	Current coal-fired generating plants have high emissions, low efficiency	Limited generation capacity and power distribution infrastructure does not allow for widespread use for heating.

553. **Conclusion on heating source alternatives.** The engineering team has considered a number of options for heating supply for Tranche 3 during the early stages of feasibility study planning, such as geothermal heating, coal burning heating plant and connection to the centralized heating supply grid. Then finally, it was decided that heating supply for Tranche 3 subcenters will be covered by the central heating network as confirmed by the UBDN on 31 August 2019.

VII. PUBLIC CONSULTATION

A. Identification of stakeholders

554. Stakeholders were identified and engaged in a participatory manner with assistance from the PMO/MUB, khoroo leaders, and the national consultant team. The stakeholders involved in consultations included:

(i) Representatives of PMO or MUB;
(ii) Representatives of affected households and local communities in of khoroos No.9,17,19,22, and 24 in the Sharkhad subcenter;
(iii) Representatives of affected households and local communities and businesses in khoroos No.1,2,3, and 22 in the Tolgoit subcenter;
(iv) Representatives of businesses, service outlets and entities in both subcenters; and
(v) Representatives of relevant government institutions such as USUG, Heating Distribution Network Agency of UB city and local authorities of Bayanzurkh and Songinokhairkhan districts.

B. Consultation process

555. During the concept design stage, the Consultant team has conducted initial meetings with key stakeholders such as representatives of the affected khoroos and organized focus group discussions with potentially affected people in April 2019. The project-affected community residing in the subcenters has already gained a reasonable knowledge about the potential grievances, which may arise in the future.

556. Public consultation meetings were organized at each of the 9 affected khoroos between 18 June 2019 and 24 June 2019. Advertisement of the consultation meeting was conducted by the unit leaders under the khoroo (each khoroo is divided into 4-5 units-a subdivision) and the relevant khoroo administration staffs by visiting households in the subcenters. The local communities were notified of meeting schedule, venue and agenda along with invitation for the meeting in advance of 7 days of each meeting.

557. Project features, benefits, impacts and the Grievance Redress Mechanism (GRM) were presented to the local community members during the consultation meetings. Opinions, concerns and suggestions of local communities and the stakeholders were collected in both verbal and written form during and after the public consultation meetings. Questionnaire sheets aimed to identify key concerns of local community were handed out to attendants of the consultation meetings together with project introduction brochures. Results of public consultation meetings including opinions, suggestions received have been integrated and incorporated into this report.

558. The PMO keeps records of the key stakeholders, affected communities and public consultation meeting track records that will be used for future consultation events during the pre-construction and construction phases.

C. Consultation details

559. During the site visits, the consultant team has made numerous observations and held discussions with relevant local district and khoroo leaders and residents which would be helpful for project design: (i) location of proper access roads, laydown area for materials to be used by the construction companies to use without disturbing the local community, (ii) avoidance of underground existing pipes for water, heating, sewage etc. at these proposed work sites, (iii) right of way for construction vehicles and provide traffic safety during construction to local residents, pedestrians and children, (iv) increased traffic congestion caused by transporting construction materials to the construction sites; (v) distance between the construction sites and non-sensitive biodiversity areas and cultural heritage sites to ensure no impact, (vi) dust and noise emissions from the construction subprojects and their impacts on local community, (vii) if any linked or associated facilities are present, and (viii) check climate change vulnerability of the location.

560. The consultant team along with khoroo leaders conducted group discussions with the public residing in subcenters to sensitize them about project activities, their impacts and get their suggestions. Annexure 7 indicates a summary of public consultations conducted during the field survey along with socio economic profile in the project affected area.

561. Consultations were carried out with various stakeholders such as PMO representatives, relevant khoroo governors and representatives of khoroo Citizen Councils. As part of the assessment, approximately 358 representatives from surrounding households, entities, apartments/buildings have been surveyed/interviewed to collect the data during the in June 2019.

562. The local community consulted was requested to air their opinions freely, on the project, its impact, and suggestions for mitigating adverse impacts. People participated in voluntary public consultation sessions to express their view about the proposed project. No major environmental issues were raised during the consultation process.

563. Table 91 provides summary of public consultations. Table 92 below summarizes some follow-up actions recommended by the consulted people.

Table 91. Summary Findings of Public Consultations

#	Issues Discussed	Summary Responses and Suggestions from the Participants
1	Do you support for the construction of new roads, buildings and utility pipelines in your area of residence?	Overwhelming majority of the participants (90.5% or 323 people) are supportive of the construction of new roads, buildings and utility pipelines in your area of residence while 4% (13 people) replied no and 6% (21 people) did not respond. The reason for 13 persons not being supportive

#	Issues Discussed	Summary Responses and Suggestions from the Participants
		of the project is that they fear they might be affected by land acquisition. That was during the consultation during June 2019 when land acquisition plan was not ready.
2	How would you evaluate environmental pollution in the living area (air, soil and water pollution etc.)	71% of the survey participants replied that environmental pollution is very high in the subcenters while only 3% replied responded that there is no pollution. Most frequently mentioned answers were air pollution (201 people) followed by soil pollution (53 people).
3	Will this construction activity cause any negative impact to you?	182 respondents (51%) answered that construction activities will not exert any negative impact for them while 34% (120 people) think it might.
4	Would you have any problem if the construction company makes access road in your parking area, dig any pipeline etc. for repair for diversion?	64% of participants said they don't have problem with construction company makes access road in their parking area or dig pipeline while 32% says it might cause a problem. 4% of participants did not respond. In order to address the concern for 32% of the participants, the EMP included mitigation measures that require any temporary use of land shall be consulted with affected people in advance and obtain their permission.
5	Would you be having trouble if construction causes some dust during digging and storing?	56% participants replied dust emission caused by construction is not an issue for them while 137 (38%) participants said it might cause a trouble.
6	Will you have a problem if the construction activity generates vibration and noise such as concreting, cutting, digging etc.?	64% of participants replied vibration and noise during the construction will not be a problem for them while 117 people (33%) replied it will be a problem.
7	Are you concerned about health and safety of children, residents and pedestrians the during construction?	67% of participants (237 people) said they will have concerns about health and safety of patients, residents and staffs during the construction, while 29% (103 people) said they don't worry about this.
8	Would you like to participate in safety monitoring and controlling activities during the construction period?	217 (61%) of participants would be interested in participating safety monitoring activities for forming a committee.
9	Any other critical environment related issue and concern by the residents for the during construction and operation stage?	55% of participants think there will not be any critical environment related issue during the construction while 139 people (39%) think there will be issues such as dust and noise.
10	If you have any problem caused by the construction, whom would you like to contact? (Construction company, local khoroo administration or PMO etc.)	If they encounter any problem regarding construction, 34.8% of the survey participants will contact their local khoroo administration while 9.6% will contact the local district administration, 9% will apply to MUB, 17.7% will apply to PMO and 23% will directly contact the construction company. 5.7% have no idea about whom to contact.
11	What other organizations of environment and nature conservation (NGOs/CBOs/ Civil Society) active in the area? Name of these organizations	77% of the survey participants responded that there are no NGO's in their area of living while 19% said yes there are.
12	Any other issues or comments?	Following additional comments are raised during public consultation. All these comments are recorded by the PMO and will be considered for design development. Each issue and solutions will be introduced to the local communities during the consultations during the detailed design/pre-construction phase**.** **Sharkhad subcenter:** **9th khoroo of Bayanzurkh district:** - Quickly construct paved road for us - Hospital staffs' apartment building shall be refurbished - Construct a new paved road between 42nd street and Malchnii horoolol - Improve Sharkhad bus terminal **17th khoroo of Bayanzurkh district:** - Apartment 65B needs to be connected to utility pipelines - Small streets need to be improved and upgraded within this project - Upgrade the existing flood channel and dam - We need new schools and kindergartens

#	Issues Discussed	Summary Responses and Suggestions from the Participants
		- Utility pipelines underground alignment shall be chosen smartly - The existing road is in poor condition. This shall be improved **19th khoroo of Bayanzurkh district:** - Green areas, parking areas shall be provided properly - Utility pipelines shall be further connected to each household **22d khoroo of Bayanzurkh district:** - Some streets at the end of the Sharkhad area has very steep roads due to surface features. Improve road condition there. - Some streets are prone to flood damage. These streets shall be protected with flood protection dam - Please construct a new green area and sports complex nearby streets 8-10 **24th khoroo of Bayanzurkh district:** - Improve road condition in small streets - Install speed bumps on the main roads - Provide children playground - There are existing old pipelines on Street 3. If these pipelines are connected to the centralized utility line, then 100 households will benefit - There are 2 old buildings in 10th section of Horshoolol that have not been used for many years. Find solution for these old buildings - Pay special attention to land acquisition from early stage - Households who do not connected to power lines shall be connected **Tolgoit subcenter:** **1st khoroo of Songinokhairkhan district:** - Water supply pipelines shall include both lines for cold and hot water - Please make sure streets 1–2 will be included in the project boundary - Please provide more detailed information once the detailed design is made - The inert materials from construction works shall be dumped to some streets in the subcenter where the soil is damaged - Construct a new kindergarten nearby street 113 quickly **2d khoroo of Songinokhairkhan district:** - Please make sure project boundary covers as many streets as possible - The utility pipelines shall be connected to each household - Implement the project quickly **3d khoroo of Songinokhairkhan district:** - Make stone pathways for pedestrians in each small street - Provide lightings in each street - Ensure safety during earthworks - Provide lighting for 43d street - Provide financial support for households on connection to utility lines - Make a green area along the main public road - Improve fencing of the households who live on front rows **22d khoroo of Songinokhairkhan district:** - Make sure all households in 22d khoroo is covered within the project boundary - Occupational safety rules shall be obeyed - Soil pollution is an issue here. Provide some solution for this - Construct paved roads on streets that are wide enough - New buildings and infrastructure shall be of good quality

Table 92. Summary of Recommendations by the Consulted People

#	Issue	Responsible Party
1	During pre-construction stage, introducing of EMP back to communities surrounding the sites for improving their knowledge about their responsibilities and participation in monitoring is important	Civil works contractors, relevant khoroo administrations and PMO using Advertising budget of EMP.
2	Current need for infrastructure Current lack of necessary infrastructure and external landscaping such as street lighting, road condition in small streets, inadequate flood protection facilities, green areas, children playground etc. was mentioned several times during the consultation meetings. In order to reflect current needs in the subcenters, the design team needs to review suggestions raised by local communities during the public consultation events and reflect suggestions in the design works	Design company under supervision of the PMO
3	Infrastructure planning • Alignments of the new roads shall be planned with considering opinions and the current needs of the local communities through consultation meetings and group discussion • There are a number of households in Sharkhad subcenter who are not connected to power lines. Ensure the design and plans include solution on this issue. • Alignment of utility pipelines shall be planned with considering opinions and needs of the local communities through consultation meetings and group discussion	Design company under supervision of the PMO
4	Flood protection • The design team will make a detailed flood survey and improvement of flood protection facility will be included in the detailed engineering design	Design company under supervision of the PMO
5	Land acquisition • Land acquisition and resettlement plant (LARP) prepared by the consultants of the PMO was reviewed and approved by ADB. • Land acquisition activities shall be carried out in accordance with both ADB's and domestic relevant regulations and requirements.	LARP Consultant Team under supervision of PMO and Land Acquisition Unit of MUB
6	Traffic Management • The Construction Company to ensure proper road safety for residents and pedestrians during construction. • To conduct transportation using a dedicated road in order to ensure safety of the citizens; • If Ger area street road must be used for transportation, the least populated street shall be used • Speed bumps and warning signage will be erected at certain points to reduce traffic accident risks	Civil works contractors adhere to EMP.
7	A Committee of citizens, relevant khoroo staffs and PMO for inspecting the quality of the construction and process of following safety procedures during construction.	PMO to form a monitoring committee.

564. The executing agency and the construction company shall review the above recommendations and shall conduct additional consultations at least once during the detailed design period and every six months during construction period to incorporate suggestions in their design and construction practices.

Locations and participants

565. Consultation meetings were held at 9 khoroos (5 khoroos in Sharkhad subcenter and 4 khoroos in Tolgoit subcenter) in total where the local khoroo administration staffs and citizen representative council at each khoroo have assisted the consultant team.
566. Annexure 7 gives the names of all participants of the public consultation conducted by the team. Consultation details at the nine khoroos are also attached. Table 93 provides a summary of location and number of participants for the consultations.

Table 93. Location and Number of Participants of Consultations

No	Khoroos of Tranche 3	Subcenter	Number of Participants at Consultations Meetings			Number of people filled in questionnaire
			Total	Male	Female	
1	9th khoroo of Bayanzurkh district	Sharkhad subcenter	40	6	34	36
2	17th khoroo of Bayanzurkh district	Sharkhad subcenter	53	6	47	50
3	19th khoroo of Bayanzurkh district	Sharkhad subcenter	17	6	11	14
4	22d khoroo of Bayanzurkh district	Sharkhad subcenter	26	4	22	19
5	24th khoroo of Bayanzurkh district	Sharkhad subcenter	61	17	44	63
6	1st khoroo of Songinokhairkhan district	Tolgoit subcenter	32	10	22	36
7	2d khoroo of Songinokhairkhan district	Tolgoit subcenter	44	15	29	47
8	3d khoroo of Songinokhairkhan district	Tolgoit subcenter	43	9	34	46
9	22d khoroo of Songinokhairkhan district	Tolgoit subcenter	42	24	18	46
Total			**358**	**97**	**261**	**357**

*A total of 358 people attended consultation meetings at 9 khoroos of Tranche 3. Out of which, 357 people filled out questionnaire sheets.

Table 94. Employment status of the consultation participants

Employment	Number of participants	Percentage in total
Employed by state entities	55	16.6%
Employed by private entities	81	24.4%
Unemployed	63	19.0%
Pension	121	36.4%
Disabled	12	3.6%
Total	**332**	

*Out of 357 participants who filled out questionnaire sheets, only 332 people responded with their employment

information while 25 people did not respond to the employment question.

Table 95. Age Groups of the Consultation Participants

Age groups	Number of participants	Percentage in total
Aged under 35	46	13.1%
Aged between 35-59	214	61.0%
Aged over 60	91	25.9%
Total	**351**	

**Out of 357 participants who filled out questionnaire sheets, 351 people responded with their age information while 6 people did not respond to the age question.

D. Information disclosure

567. In line with ADB's Public Communications Policy, MUB has made the relevant project information about environment safeguard issues available during the initial stages to affected people and other stakeholders, where it is publicly accessible in Mongolian language and in a manner understandable to the local community. ADB and MUB will also upload and display the IEE documents for their respective websites once finalized.

568. Incorporation of the environmental concerns of affected persons (APs) through the public consultation in the decision-making process will avoid or minimize conflict situations during the implementation process as well as enable them to provide meaningful inputs into the project design and its implementation.

569. Public consultation will be a continuous process through all stages of the Tranche 3: design phase, pre-construction phase, construction phase and operational phase. During the implementation period, the PMO together with civil works contractors and relevant khoroo leaders will conduct public consultation and information disclosure through public meetings and notice on regular basis.

VIII. GRIEVANCE REDRESS MECHANISM

A. Grievance channels (framework)

570. During public consultation sessions of the IEE study, the discussions with local khoroo residents and representatives of service outlets in the Sharkhad and Tolgoit subcenters were conducted to make them aware of the proposed project. Thus, the project-affected community residing within the subcenters has already gained a reasonable knowledge about the potential grievances, which may arise in future.

571. The public was informed preliminary plans and components of the Tranche 3, potential impacts and mitigation measures during the construction stage as well as the grievance redress mechanism. Further going, the affected communities will be regularly engaged through community awareness program, consultation meetings and group discussions during the pre-construction and construction and operational stages by PMO consultants.

B. Time frame

572. A community awareness program must be conducted one month prior to commencement of construction by the Project Management Office (PMO) under the MUB regarding the scope of the project, procedure of construction activities, utility of resources, land acquisition, identified impacts and mitigation measures. These awareness programs will help the community to resolve problems, clarify their distrusts related to the proposed project at initial stage. The Community should be informed about the Grievance Redress Mechanism (GRM), which is already established as per MUB and Government of Mongolia procedure for making complaints, including the place and the responsible person to contact in practical way in this regard. Almost all the stakeholders related to the GRM will also be aware of the established grievance process, the requirement of grievance mechanism, goals, benefits, relevant laws regulations etc.

C. Grievance redress mechanism

573. ADB procedures require the MUB to establish a Grievance Redress Mechanism (GRM) which ensures suitable grievance redress procedure for the project affected persons. The GRM would address affected persons' concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to the affected persons at no cost.

574. Ulaanbaatar city has adopted its own grievance redress system in 2013 with the mayor's Order No. A/1086. All agencies and projects under MUB are required to implement this GRM system (Figure 84 below). GADIP Program has adopted this GRM system which is currently being implemented for the Project 1 phase of the Program.

Figure 84. Grievance Redress Mechanism of the Municipality of Ulaanbaatar

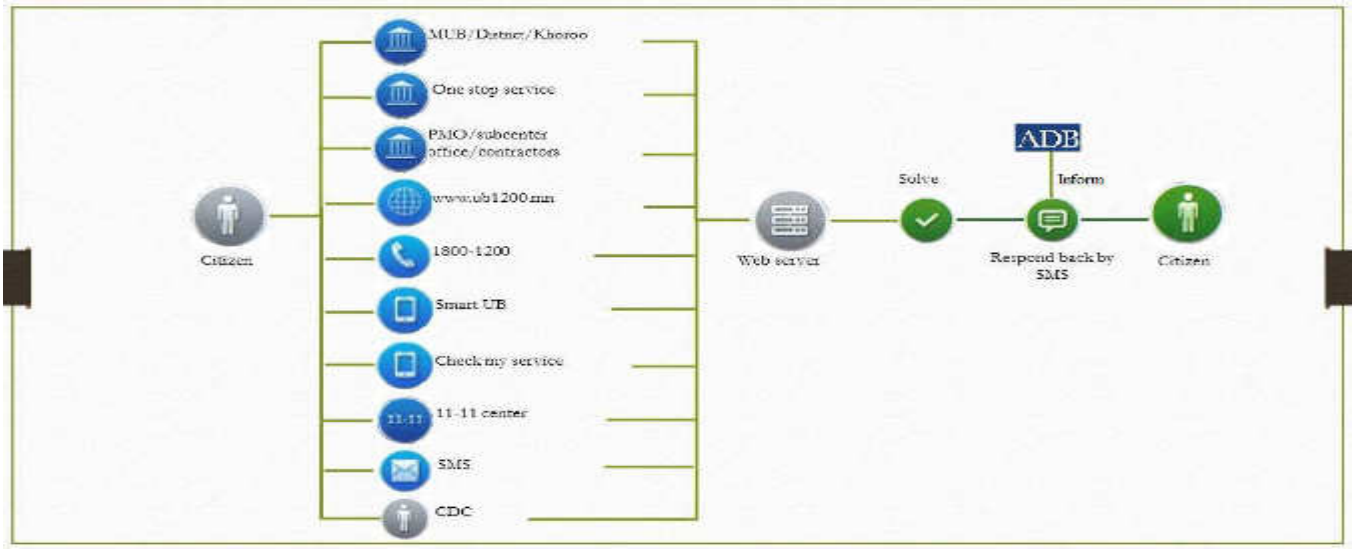
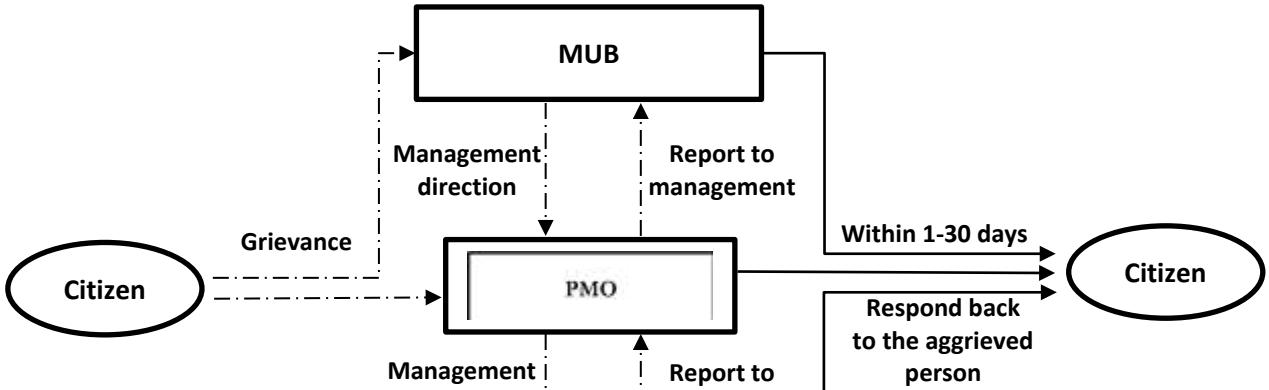


Figure 85. Grievance Resolution Diagram



575. This Grievance Redress Mechanism (GRM) provides an effective approach for resolution of environment related complaints and issues of the affected person/community. Project Management Office (PMO) formulates procedures for implementing the GRM and PMO's engineering staff shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. paying particular attention to the impacts on vulnerable groups.

576. The GRM system has 4 steps as described below.

577. Step 1: Access to GRM. The GRM system enables affected person (local residents, representatives of local business entities, workers of contractors etc) to issue a complaint choosing the most comfortable way out of 10 options (see Figure 85 above). The affected person's complaint will directly be recorded in the central web server of MUB which is linked to all 10 entry points shown in Figure 84. The complaint record includes details such as the grievance issue, the affected person's name, contact and date of grievance.

578. Step 2: Received complaint is assigned to the relevant personnel either in PMO or to the relevant department/division/unit in MUB.

579. Step 3: The PMO will take steps to investigate and resolve the issue (Figure 85). This may involve instructing the contractor to take corrective actions. The contractor should implement the redress solution and convey the outcome to the PMO and notify ADB. Depending on the type and complexity of the grievance issue, PMO/MUB to solve the issue between 1-30 days after receiving the compliance.

580. Step 4: PMO will respond to the affected person with the solution or corrective action. Once the solution is provided to the affected person, compliance officers of MUB contacts the affected person with a separate call to confirm if the person is satisfied or not. Received complaints, solutions and redress status will be included in the Environmental Monitoring Report to ADB.

581. If the affected person is still not satisfied or if no solution can be identified by the PMO, then the person may apply to the court.

582. The PMO will keep records of all grievances received including contact details of the aggrieved person, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effective, and final outcome. The PMO will issue public notices to inform the public within the project area of the GRM. The PMO's phone number, fax, address, email address will be disseminated to the people at the khoroo offices and construction sites. The PMO will have facilities to maintain a grievance database and communicate with construction company, construction supervision engineers, the environmental inspectors of the local offices of GASI, relevant district and khoroo administrations.

The GRM will be in place until after the Project Completion Report is issued; and will utilize the above mentioned GRM procedure for grievance redress actions.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

583. This environmental management plan (EMP) is prepared for the Tranche 3 phase of the Ger Area Development Investment Program which covers Sharkhad and Tolgoit subcenters. Components of tranche 3 are summarized in Appendix 1.

584. Environment safeguards classification by the Asian Development Bank (ADB). According to the requirement of ADB's Safeguard Policy Statement (SPS, 2009), the Project is categorized as "B" for environment since the adverse environmental impacts are manageable and can be minimized through implementation of mitigation measures specified in this EMP.

585. Mongolian safeguards requirements. The Law on Environmental Impact Assessment (2012) requires environment impact screening (general environmental impact assessment [General EIA]) for both subcenters. Project activities include construction and expansion of utility pipelines and construction of social buildings (please refer to Table 1 below). These activities will require an environmental impact screening (General EIA) by the Province/Aimag Department of Nature and Environment. All interventions must comply with the Mongolian laws, regulations and standards including those related to environment, health and safety.

586. ADB safeguards standards. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety (EHS) Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in this document. The Mongolian standards and the corresponding World Bank EHS guidelines in presented Annexure 4.

587. Purpose of the environmental management plan. The environmental management plan (EMP) has been prepared to define the procedure to be followed by the MUB, the Project Management Office (PMO), the construction companies, detailed design and supervision consultants, the engineers and the environmental safeguards specialist of the PMO for the avoidance or mitigation of adverse environmental effects that may arise out of construction works of facilities in relation to the Project.

588. Proposed mitigation measures will be incorporated into tender documents, construction contracts, and Environmental Management Plans. Both Contractors and PMO will implement the measures and their effectiveness will be evaluated on the basis of the results of the environmental monitoring to determine whether to continue them or to make improvements.

589. The Bid Documents for the potential Contractor(s) shall contain two sections relating to environmental issues, firstly a basic clause indicating that the Contractor will be responsible for following the requirements of this IEE/EMP and that he should prepare his own Site-specific EMP (SEMP) for the Project. Secondly, the EMP of the IEE shall be repeated in its entirety as an Annex

to the Bid Documents so as the bidder is aware of his environmental requirements under the Project (both Pre-construction, Detailed Design and Construction) and help him put costs to his proposal (such as costs for noise monitoring, etc.).

590. The EMP requires civil works contractors to plan for the construction projects, including issues such as work scheduling, consultation with and notification to potentially affected people. This EMP follows the Government of Mongolia's regulations relevant to this Project, as well as ADB's SPS (2009). This EMP will be included as a separate annex in civil work contracts. The MUB, through the PMO and assisted by its environment safeguard specialist, will be responsible for ensuring contractors' compliance with the EMP. The EMP attached in Annexure 2 will be used by all types of construction subprojects (Category B type interventions) by the Contractor for report on environment mitigation measures undertaken.

591. The contractor's site-specific EMP's must be prepared and submitted within 30 days of the contract award and pre-construction and Construction cannot commence until the SEMP is approved by the PMO and the Engineer.

592. Throughout the Construction phase, the Contractor must employ an on-site environment specialist (OES) to update the SEMP and to oversee and report on the operation throughout the contract period. The OES should be full-time member of contractor's staff.

B. Components of Tranche 3

593. The Tranche 3 will be implemented in two subcenters in Ulaanbaatar city ger area: Sharkhad and Tolgoit. The Components of Tranche 3 are summarized in below table.

Table 96. Tranche 3 Components[23]

Facilities[24]		Sharkhad project area	Tolgoit project area
Project Area		ADB project area: 124 hectares The subcenter area: 507 hectares	ADB project area: 153.4 hectares The subcenter area: 737 hectares
Project Area Population		ADB project area: 8939 The subcenter area: 32395	ADB project area: 6,860 The subcenter area: 18,545
Quantities of the Proposed Infrastructure	**Road**	Main road: Length 2.92 km, width 24.7 m Local road: Length 5.96 km, width 14.7 m Total length: 8.87 km	Main road: Length 1.53 km, width 24.7 m Local road: Length 6.16 km, width 14.7 m Total length: 7.69 km 5 small bridges with total length of 160 m
	Heating	✓ Heating Supply Pipelines L= 6.62 km, diameter (D2x150~350 mm) ✓ Heat distribution substation (Nos.) = 3 Nos.	✓ Heating Supply Pipelines L= 4.31 km, diameter (D2x150~700 mm) ✓ Heat distribution substation (Nos.) = 7 Nos.
	Water	Water supply pipelines: diameter D150~400 mm, L =7.95 Km New water reserve with capacity V = 2x1,000 m^3 New pump station with capacity Q = 6,000 m^3/day	Water supply pipelines: diameter D150~300 mm, L=2.9 Km Expansion of existing water supply pipelines: diameter D150~250 mm, L = 941 m New pump station with capacity Q = 4,600 m^3/day
	Sewage	Sewage pipeline: diameter D200~300 mm, L = 3.85 Km	Sewage pipeline: diameter D200~300 mm, L = 6.56 Km
	Flood protection		Flood control reinforced concrete channel: width 1-4 m, total length: 3.12 km Sediment retention pond: 2 Nos.
	Power supply	Electricity switch gears: capacity of 10kV each - 2 Nos. Closed type substations with transformer of 2x630 kVA power – 10 sets Electricity transmission line with 10kV capacity: L = 20 km	Electricity switch gears: capacity of 10 kV each - 1 Nos. Closed type substations with transformer of 2x630 kVA power – 8 sets Electricity transmission line with 10 kV capacity: L = 15 km
	Telecommunication	Telecommunication's service and data center/3-storied building with 1,008 m^2 size/ -1 pcs Fiber optic cable: L = 5.5 km	Telecommunication's service and data center /3-storied building with 1,008 m^2 size/ -2 pcs Fiber optic cable: L = 4.1 km

[23] The proposed infrastructure for Tranche 3 follows the Ulaanbaatar City Master Plan 2030.
[24] Heating and water demand estimations are based on projected population densification and increase by 2030

Facilities[24]		Sharkhad project area	Tolgoit project area
		Primary duct (4+0), L5T type manhole/medium/: L = 8.85 km Primary duct (9+0), M1 type manhole/large/: L = 1 km Tower: 1 Nos. with height 25-30m	Primary duct (4+0), L5T type manhole /medium/: L = 8.7 km Primary duct (9+0), M1 type manhole /large/: L=0.5km Tower: 1 Nos. with height 25-30m
	Social Facilities	✓ 1 Kindergarten (230 Children)- 12,190 ㎡ ✓ 1 Sport Complex, - 20,013.5 ㎡ or 15,430.6 ㎡ (2 options) ✓ 1 Community Development Center - 10,203 ㎡ ✓ 1 Business Incubator - 7,542.8 ㎡ ✓ 1 Urban Park / Green Belt - 16,432.5 ㎡	✓ 1 Kindergarten (240 Children)- 12,720 ㎡ ✓ 1 Community Development Center - 4,609 ㎡ ✓ 1 Business Incubator - 4,695 ㎡ ✓ 1 Urban Park/ Green Belt - 9,324 ㎡ and 12,432 ㎡ ✓ 1 primary health center with 50 beds

C. Summary of potential impacts

594. The environmental impacts management matrix has been prepared for the project that discusses the anticipated impacts, monitoring requirements, and development of mitigation measures with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase.

595. The short-term construction disturbances concern noise, dust, reduced access, increased traffic and risk of traffic accidents, worker and public safety, and local soil erosion and surface water sedimentation, and solid and liquid waste. These short-term impacts will be managed and mitigated with EMP provided in below section.

596. Resettlement and compensation will be addressed by the separate Land Acquisition and Resettlement Plan (LARP) for Tranche 3.

Table 97. Summary Analysis of Positive and Adverse Impacts

1	Project Activities	Positive Impacts (Type)
A	**Construction**	
i	Employment	Employment opportunity to local population. (Temporary)
B	**Operation**	
i	Socio -economic impact	Households and businesses in the subcenters will be connected to centralized water supply heating and sewage pipelines and provided with improved waste management facilities and road networks that will help to improve quality of life for the local community. Reduced use of coal burning stoves and open toilet pits will help to improve air quality and soil quality.
2	**Project Activities**	**Adverse Impacts (Type)**
A	**Pre-Construction**	
i	Land acquisition	Resettlement will be required for the new roads, and some of the new buildings and the new social service facilities.
ii	Temporary use of land	The mobilization of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites
iii	Type and scale of insulation of pipelines	The design must lead to introduction of energy efficiency elements and conforms to national standard requirements.
iv	Flood risks	The project design must ensure the existing drainage network, to which the new tertiary network will connect, is not flooded with silt and sediment from the upstream excavation and earthworks activities.
v	Linked facilities	The PMO must confirm from concerned authorities of various linked facilities such as landfills to accept solid waste, underground utilities such as heating pipes, sewage drainage, water pipeline etc. The detailed design and supervision consultant under PMO shall do the due diligence from design stage to construction stage.
i	Influx of workers	Health and safety of workers at site may pose risks; concentration of labor force creates un-hygienic condition and sanitation hazard (Temporary).
ii	Construction equipment / materials	Equipment installations may create noise; carrying of construction materials may create traffic congestion; cutting/filling, stockpiling of construction material and traffic movement may create dust emission, improper management of construction debris and solid waste may pose risk to the workers, nearby businesses and residents (Temporary).

1	Project Activities	Positive Impacts (Type)
iii	Vehicle and pedestrian traffic	More congestion near construction sites; increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads; pedestrians to exercise care with increase of vehicular traffic on the adjacent roads and increase of exhaust emission from vehicles (Temporary).
	Community H&S	Increased movement of construction vehicles transporting construction materials, earthworks and other construction activities might lead to community health and safety concerns including traffic and pedestrian safety concerns. Suitable construction timing which aims to reduce disturbance on local communities.
	Waste generation	Domestic and construction waste (including inert materials) will be generated during the construction period.
C	**Operation**	
i	Increased traffic	Improved/expanded and new roads might lead to increased vehicle accidents, and increased GHG production
ii	Water supply and sewerage networks	Concern failure of the pipelines leading to leakage or mass spills
iii	Heated water supply	Concern failure and rupture of a pipeline at, or between the 20+ heating line substations in the subcenters
iv	Waste generation	Medical waste will be generated from the primary health center during its operation.

Table 98. Summary of Adverse Impacts on Key Environmental Parameters

#	Environmental parameters	Impact Degree	Reason	Proposed Mitigation Measures
1	Air Quality	Medium	Dust emission from the construction activity and emission of air pollutants from vehicles transporting construction material at site	Regular sprinkling of water, proper handling of excavated soil, construction material, banned substances/VOCs, etc.
2	Water Quality	Low	The project will require small quantity of water for construction. No hazardous effluent is envisaged to be discharged during construction	The required water will be sourced from tankers by the construction company or from nearby wells in the subcenters.
3	Soil quality	Low	Soil erosion due to movement of construction trucks and soil pollution due to oil spills	Construction company will implement Spill management plan and affected land sites will be restored at the end of construction period.
4	Noise level	Medium	The construction activity may lead to noise pollution during concreting –steel cutting, bending, casting using vibrators, operation of mechanized equipment and drills etc. that will affect the local community	Noise monitoring will be done at regular intervals. If any night construction activity that is noise intensive is undertaken, staff and neighborhood must be consulted to determine suitable timings.
5	Land acquisition	High	Land acquisition and resettlement is required to provide sufficient space for the project to construct new roads and social buildings and utility pipelines.	A detailed LARP was prepared for Tranche. Affected households will be consulted, surveyed, negotiated and resettled in proper manned following to the ADB SPS Guidelines and relevant domestic regulations.

#	Environmental parameters	Impact Degree	Reason	Proposed Mitigation Measures
6	Community health and safety	Medium	Increased movement of construction vehicles transporting construction materials, earthworks and other construction activities might lead to community health and safety concerns including traffic and pedestrian safety concerns. Suitable construction timing which aims to reduce disturbance on local communities.	The construction company will mitigate community health and safety impacts and risks following to EMP measures. All construction workforce including drivers will be trained in prior to commencement of construction works. A Traffic Safety Plan will also be implemented by the construction company. Construction activities will be stopped during night time between 20:00pm – 08:00am. Transportation of construction materials to the Sharkhad subcenters is recommended to be made on Mondays when the automobile market is closed.
7	Occupational Health and Safety	Medium	Various construction activities, such as cutting, welding, working at heights, connection of electric devices and loading and unloading of contsruction materials etc., might cause accidents or injuries to construction workers.	The civil works contractors are required to: i). have an internal H&S manuals and norms that meet relevant domestic regulation and standards; ii). enforce their internal H&S manuals at all workplaces; iii). Have a full-time on-site H&S staff/engineer to ensure compiance of H&S manuals; iv). Provide all construction workers with personal protective items including helmets, protective clothes and boots, glasses, gloves and masks; v). Organize H&S training for all construction workers at the begininng and during the construction season; vi). Worksite safety pre-cautions including erection of signs or boards warning of hazards at all workplaces; vii). Have Emergency Response plan which clearly defines procedures to be followed by workers and the management in case of emergency, hazard prevention measures, reporting system and important contacts.
8	Waste generation	Low	Domestic and construction waste will be generated during the construction period. Domestic waste will be generated from the social buildings during the operation period. Medical waste will be generated from the primary health center during its operation.	The construction company will implement Waste Management Plan throughout construction period following to the EMP. Operational entities will sign waste removal agreement with relevant district urban service agencies. The primary health center will sign medical waste removal agreement with the licensed agency – Element LLC which operates medical waste handling facility nearby UB city.
9	Operational impacts	Low	Improved infrastructure and new roads will lead to increased traffic emission and traffic safety concerns. Connection to the centralized water supply and	Traffic Department of MUB will ensure that traffic signs, speed bumps and pedestrian crossings are provided in the area. USUG[25] will be responsible operational

[25] USUG – Ulaanbaatar city Urban Water Affairs and Management Authority.

#	Environmental parameters	Impact Degree	Reason	Proposed Mitigation Measures
			waste water might lead to increased water consumption and waste water generation in the project areas.	efficiency for water supply and waste water infrastructure for the areas.

D. Stakeholder Engagement

597. The stakeholder consultation program that was developed within this IEE will be continued throughout the pre-construction, construction and operation phases of the Tranche 3. Community wide awareness campaigns will be included in support of the consultations.

598. The public and stakeholder concerns of both subcenters are emissions of noise and dust and traffic safety during period construction period. Disrupted and unsafe pedestrian movement through the ger area streets is also a concern which is critical for daily transport of water to the homestead. These issues plus any others should be reviewed during follow-up consultations that should be scheduled during the:

(i) Pre-construction or detailed design phase;
(ii) During construction phase; and
(iii) During operation phase.

E. Institutional arrangements and responsibilities

599. The Municipality of Ulaanbaatar (MUB) which is the executing agency for Tranche 3 will take overall responsibility for successful implementation of the EMP with assistance from a Project Steering Committee (PSC) established for Tranche 3. Internal support of MUB will be from the Subcenter Redevelopment Authority (SRA) established under jurisdiction of Vice Mayor as a city-owned enterprise for Urban Development.

600. The Project Management Office (PMO) of MUB will manage directly the successful completion of the EMP with its Environmental Safeguard Staff. The Ulaanbaatar Water and Sewage Authority (USUG) will provide required technical assistance to the PMO for the EMP. The Project Units (PU) within the SRA will assist the PMO with the EMP at the subcenter level. A licensed Mongolian Institute and Laboratory will be retained to conduct all required analyses of monitoring samples collected for the Monitoring Plan of the EMP.

601. Externally, support for implementation of the EMP by the PMO/MUB will be provided by an international Project Implementation Support Team (PIS) which will include EMP compliance monitoring and reporting. The construction package contractors will be responsible for implanting the EMP through their own contractor EMPs (CEMP) that they develop from the EMP as part of their bid documents.

602. Major and minor responsibilities of institutions and personnel for environmental management of Project 3 are further defined below.

603. As an implementation agency, the Municipality of Ulaanbaatar (MUB) is responsible for obtaining General impact assessment (GEIA) from Ministry of Environment and Tourism (MET) which is required for the Project to proceed with conducting domestic DEIA.
Project Steering Committee (PSC) is responsible for: (i) deciding on environmental management matters that require action from senior management; and (ii) ensuring allocation and timely disbursement of adequate resources for monitoring EMP implementation, and required environmental monitoring of Environmental Monitoring Plan by the implementing agency.

604. Subcenter Re-development Authority (SRA) is a special purpose institute who is responsible for facilitating, coordinating, and managing the re-development and densification process in Ulaanbaatar city. It will assist in realizing Subcenter Development Plans (SDPs) and ensure strict application of the development plan, principles, land use ratios, construction standards; and supervise private sector participation in the construction of residential units/compounds, in accordance with community needs and expectations, and private sector interests. The SRA will also: (i) facilitate the necessary inputs and/or assistance from the subcenter khoroos, communities and concerned private sector to meet environmental safeguard obligations; and (ii) firm up collaboration with subcenter khoroos in consultations and information disclosure, environmental monitoring, and implementation/observance of the grievance redress mechanism (GRM).

605. Ulaanbaatar Water and Sewerage Authority (USUG) is the sub-implementing agency, responsible for: (i) providing technical assistance and support to the PMO in EMP implementation; (ii) operations of completed water and sewerage structures, observing the Program GRM, and implementing environmental mitigation and monitoring measures the Project EMP.

606. Program Management Office (PMO) will be responsible for undertaking and managing daily activities of Tranche 3. Its Environmental Safeguard Staff will coordinate and supervise EMP implementation, including but not limited to: (a) update the EMP after the detail project design is available; (b) oversee incorporation of EMP recommendations into the contractor design/bid documents, and ensure procurement of environmentally responsible contractors; (c) ensure that domestic DEIA prepared and approved by MET prior to awarding of civil works contracts; (d) establish baseline ambient air quality, noise and vibration levels, ground and surface water quality, baseline statistics on incidence of diseases, road accidents and crimes occurring at night in the unlit roads in affected khoroos; (e) establish and coordinate grievance redress mechanism (GRM); (f) review and clear the Contractor's site-specific EMPs; (g) monitor contractor activities to ensure compliance to the EMP; (h) prepare monthly reports on EMP implementation to the PMO; (i) conduct consultation meetings with local stakeholders as required, informing them of imminent construction works, and updating stakeholders on latest project development activities, GRM, etc.; and (j) support training conducted by environmental specialist (ES) of the Project Implementation Support Team (PIS) (see below), EMP compliance reviews, annual reporting, etc. Project Units (PUs) under the SRA are responsible for assisting the SRA and PMO in environmental management at the sub-center level, particularly in consultations and information disclosure, IEC campaign, environmental monitoring, and implementation of Project grievance redress mechanism (GRM).

607. Project Units (PUs) under the SRA are responsible for assisting the SRA and PMO in environmental management at the subcenter level, particularly in consultations and information disclosure, IEC campaign, environmental monitoring, and implementation of Project grievance redress mechanism (GRM).

608. Contractors will develop, implement, and (internally) monitor implementation of their Contractor's site specific EMPs (SEMP) that are fully responsive the Project EMP, adhere to the clauses the PMO and PIS-ES establish for incorporation into bidding procedures: (a) a list of environmental management requirements to be budgeted by the bidders in their proposals; (b) environmental clauses for contractual terms and conditions; and (c) the full EMP in Mongolian.

609. Affected Khoroos through their designated counterpart with PMO will actively participate in: (a) public disclosure of Project 3 IEE, EMP and EMR's, (b) the community awareness program on health and safety impacts of Tranche 3 implementation; (c) establishment of health and safety baseline data prior to construction; (d) review EMR's and

results of environmental monitoring by Contractors, and (e) ensure necessary corrective actions are taken for reported environmental/social non-compliance that are confirmed as being caused by Contractor negligence.

610. Project Implementation Support (PIS) Team, and the Environmental Specialist (PIS-ES), is responsible for imparting technical advice, guidance, and "hands-on training" to the PMO and SRA, particularly its ESS, in EMP implementation of Tranche 3. The PIS-ES will support the PMO, the PMO-ESS, SRA, and USUG with (a) project preparation; (b) training, (c) yearly environmental progress and EMP compliance monitoring; (d) annual EMP monitoring and progress reporting; (e) identifying environment-related implementation issues and necessary corrective actions; (f) undertaking site visits as required; and (g) conduct baseline monitoring prior to construction, and quarterly environmental monitoring during construction and operation phases in accordance with the Monitoring Plan of this EMP. The PIS will comply with Mongolian Quality Assurance/Control procedures and regulations for sampling and monitoring of environmental media and assess compliance with Mongolian environmental quality standards for ambient air, water and noise quality.

611. Asian Development Bank (ADB) is responsible for reviewing relevant documents for clearance purposes, and conducting periodic review missions to review, amongst other things, the environmental aspects of Tranche 3. For example, clearance will be required for the updated EMP at detailed design phase of Tranche 3, and subsequent environmental monitoring reports (EMR) during implementation phase of Tranche 3.

Table 99. Responsibilities and Roles for Implementation of the Environmental Management Plan

Phases of Tranche 3	Environmental Responsibilities/ Tasks	Responsible Agencies
Project Preparation	Obtain GEIA from MET	PMO
	Conduct IEE in accordance with ADB SPS (2009)	PMO through its consultants
	Organize Public Consultation at Tranche 3 subcenters	
	Review and approval of IEE	ADB
Detailed Design	Conduct domestic DEIA	PMO by hiring a local licensed firm
	Review and approval of DEIA reports by MET	
	Incorporation of environmental mitigation measures in Detailed Design works and bidding documents	Design Institutes
	Update EMP to meet detailed design	PMO through PIS (in this case CS01: DMEC Engineering)
	Review and approval of updated EMP	ADB
	Provide updated EMP to Design Institutes	PMO
Civil Works Bidding	Incorporate mitigation measures and EMP clauses in bidding documents, civil work contracts	PMO, SRA and tendering consultants
	Review bidding documents and confirm project readiness	ADB, PIS
Pre-construction	Prepare site-specific EMP's (SEMP)	Civil works contractors
	Review and approval of SEMP's	PMO, PIS
	Obtain necessary permits (i.e. waste disposal, use of borrow pit, water use and worker's camp etc.) from relevant authorities	Civil works contractors
Construction	Organize EMP trainings for contractors and supervision consultants	PMO-ESS
	Implementation of EMP measures	Civil works contractors
	Conduct quarterly environmental monitoring for air, soil and water quality	
	Ensure monthly progress reports include EHS sections	

Phases of Tranche 3	Environmental Responsibilities/ Tasks	Responsible Agencies
	Implement GRM and solve and record grievances	PMO-ESS
	Conduct regular site inspections	
	Conduct trainings	
	Support PIS in preparing annual EMP monitoring and progress report	
	Coordination of environmental tasks the civil works contractors, PIS and MET	
	Prepare annual EMR and submit to ADB	
	Conduct external environmental monitoring on quarterly basis	PIS
	Conduct site inspection periodically	
	Collect and integrate EMP implementation reports from civil works contractor	
	Prepare and submit annual EMP compliance report to MET	
	Prepare annual EMP for next construction season and approval by MET	
	Provide comprehensive technical support to PMO on environmental management	
	Organize Review Missions, review and approval of annual EMP and annual EMR reports	ADB
Operation	Conduct EMP compliance review and prepare EMP monitoring and progress reports until PCR is issued	PMO
	Implementation of mitigation measures proposed in EMP	SRA
	Conduct periodic environmental monitoring	PIS
	Review and approval of EMR report	ADB

F. Institutional capacity and training needs

612. The PIS-ES will develop and deliver training courses to the PMO/MUB and implementing agencies. The purpose of the course(s) is to strengthen the ability of the project owner and implementing agencies to oversee implementation of the EMP by construction contractors, and institutes.

613. Training on the implementation of an EMP should address two thematic areas. The first area should be principles of environmental management focused on the potential impacts of Tranche 3 subcomponents on the natural and social environment. The second area should be environmental safeguard requirements of the ADB and the Government of Mongoliawith specific reference to the EMP.

614. Two approaches to training should be: 1) classroom coursework; and 2) “learning by doing” from work on the implementation of the Project 2 EMP with coaching assistance provided by the environmental specialist of the ES/PIS. On the job training begins with updating of the EMP to meet the detailed subproject designs as assisted by the PIS. Classroom training should be given by the ES of the PIS and focus on two thematic areas defined above.

615. Indicative training course topics are as follows. The ES/PIS in collaboration with the PMO would develop the number of courses that would be needed to address these topics, and the number of venues in which courses would be delivered. It is anticipated that courses would be delivered in Ulaanbaatar.

Table 100. Training Program - Summary of Training Needs

Training topic:	Summary of training purpose and content	Recipients/ Participants #	Frequency or target date	Estimated cost (USD)
Induction to EMP	Overview of EMP including site information, pollution risks and controls, and programs. Preparation of site specific EMPs and training on implementation to staff of construction company (s)	All PMO engineers / contractors	At beginning of project	2,000
Review of EMP, Refresher training on EMP	Review of EMP including new changes and updates to IEE/EMP.	All PMO engineers / contractors	One year after project start, or more frequently if required	
Project management and implementation	Implementation assessment the program. Principle of donor organizations' support to local beneficiaries.	All PMO Engineers /contractors	At the beginning of the project	
Training on specific pollution risks and controls				
Emergency response plan	To identify on-site "potential accident scenario" and how to plan potential emergency response actions.	All PMO Engineers /contractors	During the project implementation	3,000
Air Quality Monitoring	Ambient Air Quality, VOCs, Particulate Matter, Ozone Depleting Substances (ODS), Greenhouse Gases (GHG)	All PMO Engineers /contractors	During the project implementation	
Water Conservation	Water Monitoring and Management, Process Water Reuse and Recycling, Heating Systems	All PMO Engineers /contractors	During the project implementation	
Wastewater and Ambient Water Quality	Liquid Effluent Quality, Discharge to Surface Water, Discharge to Sanitary Sewer Systems, Land Application of Treated Effluent, Septic Systems, Wastewater Management	All PMO Engineers /contractors	During the project implementation	
Hazardous Materials Management	General Hazardous Materials Management, Hazard Assessment, Management Actions	All PMO Engineers /contractors	During the project implementation	
Fire safety	Fire, and Explosion Prevention, Control Measures,	All PMO Engineers /contractors	During the project implementation	
Occupational Safety, Health and Safety	Occupational Health and Safety Emergency Preparedness and Response, Community Involvement and Awareness	All PMO Engineers /contractors	During the project implementation	
Waste Management	General Waste Management, Waste Management Planning, Recycling and Reuse, Treatment and Disposal, Waste Storage, Transportation, Treatment and Disposal, Commercial or Government Waste Contractors, Health Care Waste	All PMO Engineers /contractors	During the project implementation	
Climate change and adaptation (applicable to eligible projects under the Program)	Climate change perspectives due to snow, flooding, dzuds in Mongolia and their impacts during construction and operations	All PMO Engineers /contractors	During the project implementation	
Good engineering and construction practices as mitigation measures	Sound construction practices.	All PMO Engineers /contractors	During the project implementation	
Total cost of training:				**5,000**

G. Mitigation measures plan

616. The EMP is structured by the three development phases of Tranche 3: pre-construction; construction; and post construction or operational phase. The EMP addresses the environmental issues and concerns raised at the stakeholder consultation meetings.

617. The EMP combines construction phase impacts that are common to all subcomponents, for which, single mitigation measures are prescribed. In this way, common mitigation measures are not re-stated numerous times. However, impacts and required mitigations that are specific to a subcomponent are identified. Or, common mitigations that are particularly important to an environmental or cultural component of a subcenter are underscored (Appendix 8).

618. The EMP identifies potential impacts, required mitigations, responsible parties, location, timing, and indicative costs. The EMP by design is comprehensive in order for the plan to be updated easily to meet the final detailed designs of Tranche 3.

H. Environmental monitoring plan

619. To ensure that project would not be generating a negative impact to the overall environment quality, an environmental monitoring plan (EMoP) was prepared. The monitoring activities of the project include site supervision, verification of permits, monitoring of water quality, soil, noise and air. Monitoring of the quality of water, soil, air and noise during the construction stage is a responsibility of civil works contractors. PMO will hire a professional firm to conduct external environmental monitoring during the construction phase. Environmental good practices include noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment, etc. Monitoring report should be prepared once in six months with the corrective action plan for the problem areas.

620. The environmental monitoring plan is to be utilized for measuring compliance with the EMP during the project implementation. The main objective of environmental monitoring is:

(i) to evaluate the performance of construction company in mitigating negative impacts vs. the proposed measures in the EMP;
(ii) to provide information on unanticipated adverse impacts or sudden change in impact; to determine if any impacts are irreversible in nature which required remedial measures and monitoring; and
(iii) to suggest improvement in environmental mitigation measures, if required.

621. The environmental monitoring plan (EMoP) is provided in below table. The monitoring plan is structured by the three phases (pre-construction, construction, post-construction operation) of Project 3 and consists of environmental indicators, sampling locations and frequency, method of data collection, responsible parties, and estimated costs.

622. Environmental quality standards and criteria for Mongolia are listed in Appendix D. The environmental standards WHO should also be consulted to supplement Government of Mongolia standards if required.

623. The licensed Institute will be required to implement the environmental monitoring under the supervision and coordination of the PMO/PIS. The Institute will be responsible for the sampling and laboratory analysis of environmental parameters. The PMO and PIS-ES will coordinate monitoring work with the Institute. The PMO/PIS will also provide logistical support to the EMC where necessary for the implementation of environmental monitoring plan. The Institute will comply with Mongolian environmental sampling and analytical procedures and quality standards.

1. Performance monitoring

624. Performance monitoring is required to assess the overall performance of the EMP. Performance indicators which will describe the desired outcomes for Tranche 3 as measurable events to the extent possible, such as performance indicators, targets, or acceptance criteria that can be tracked over defined time periods will be designed and implemented. Once it is in place the performance monitoring shall be done by the PMO and its consultants for each component. Performance monitoring indicators are mentioned in the table below.

Table 101. Performance Monitoring Indicators

Major Environmental Components	Key Indicator	Performance Objectives	Data source
Pre-construction Phase			
Public Consultation & Information Disclosure	Affected communities & stakeholders in Sharkhad and Tolgoit subcenters	Meetings with stakeholders contacted during IEE preparation; new stakeholders convened for follow-up consultation; and to introduce GRM to local communities	Minutes of consultation meetings, group discussions & participant lists
Updated EMP	Reflective of Detailed Designs	Update the Tranche 3 EMP by incorporating findings and changes made during the detailed design works	EMP, Detailed Designs
Bid Documents	Environmental clauses & requirements on site-specific EMP's	EMP appended to bidding documents with clear instruction to bidders for SEMP	Bid documents including TOR and environmental clauses
Training of PMO and implementing agencies	Training plan and schedule	By end of pre-construction phase, necessary training subjects will be determined and training plan will be scheduled	Pre-construction training plan and schedule
Site-specific EMP's	Site-specific conditions at construction sites and cost implication and detailed schedule	Each civil works contractor will prepare its own site-specific EMP which is in line with the Tranche 3 IEE and EMP before commencement of construction	SEMP's
Construction Phase			
Sensitive receptors	Sensitive environmental and cultural resources	Unharmed or undisturbed	EMR's, local communities and khoroos
Air quality	Dust, noise, vibration, SO2, NO2, CO	Levels not to exceed pre-construction baseline levels	Monitoring by contractors & PIS
Soil quality	Contents of heavy metals, oil and grease	Levels not to exceed pre-construction baseline levels	
Surface and ground water quality	TSS, contents of heavy metals, other chemical components	Levels not to exceed pre-construction baseline levels	
Flood channels			
Hazardous materials & waste	Oil, gasoline and other hazardous waste	Rigorous program of procedures to manage and store all waste from construction camps and sites practiced	Contractor reports and EMR's
Worker and community H&S	Injury and accident cases	Enforcement of Internal H&S manuals, Traffic safety plans, Emergency Response Plan, employing full-time on-site H&S staff, compliance to domestic and ADB regulations and requirements on OHS to prevent from	Contractor reports, EMR's and local khoroos

Major Environmental Components	Key Indicator	Performance Objectives	Data source
		accidents, safety precautions at worksites, use of personal protective items by workers, H&S training for all construction workers, Traffic safety training for all drivers, provision of safe pedestrian pathways, access route or crossings for local residents and passers by.	
Traffic safety	Frequency of disruption, traffic accidents and blocked roadway	Disruptions, stoppages or detours are managed to absolute minimum	Public inputs, contractor reports, traffic police reports
Operation phase			
Air quality	Emission level of pollutants	Levels not to exceed pre-construction baseline levels	Local khoroos, PIS reports
Increased traffic	Traffic accidents	No increase in accidents cases compared to pre-construction level	Traffic police reports, local khoroos
Operation of utility lines and services including heating supply pipelines	Stability of supply	Zero incidence or outage cases	US Heating Distribution Company
Waste management of new buildings	Compliance to waste management procedures	No physical pollution or nuisance on local communities	Local khoroos, PIS reports
Culvers installed under the new road at flood channels	Good condition of culverts	No blockage of flood channels with sediments	SRA reports
Operation of water supply and sewerage pipelines	Stability of supply	Now leakages or spills, zero tolerance	USUG

2. Reporting

625. Regular reporting on the implementation of mitigation measures, and monitoring activities during construction phase of Tranche 3 is required. PMO will be responsible for implementing internal monitoring systems for EMP implementation and will submit annual progress reports to the Government and ADB. The reports will cover EMP implementation with attention to compliance and any needed corrective actions and progress achieved against the EMP activities and milestones on annual basis. The annual EMR reports will include a description of implementable activities and their status; identify the responsible party involved in their implementation; and provide project management schedules and timeframes for doing so, along with their associated costs. Upcoming consultation measures will be incorporated in the EMP. A template of the Environment Monitoring Report is attached as Appendix 8, which will be submitted annually by PMO to ADB.

I. Estimated cost of environmental monitoring plan

626. The main benefits of the environmental mitigation plan are (i) ensuring that environmental standards are met during design, construction, and operation of the project; and (ii) providing offsets to negate project impacts especially ecological impacts. Without such expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities.

627. The costs for implementing the EMP are primarily for environmental monitoring because the costs for implementing impact mitigation measures are included with the construction costs in contractor bid documents.

628. An estimated budget of USD $5,000.00 is required for capacity building and training for environmental management for the civil works contractors during the pre-construction phase. Subjects of training sessions are provided in detail in Table 102.

629. The costs to implement the EMP will need to be updated by the PIS in conjunction with the PMO during the pre-construction phase.

Table 102. Summary of the Environmental Management Plan Costs

Project phases and activities	Estimated Cost (USD)
Pre-construction phase	
Updating EMP	Included in PMO budget
Monitoring of baseline environmental parameters (air quality, noise, soil and water quality)	2,300 (shown in Appendix 9)
Capacity building trainings for contractors	5,000 (shown in Table 101 above)
Construction phase	
Monitoring of key environmental parameters (air quality, noise, soil and water quality)	6,400 (shown in Appendix 9)
Implementation of EMP measures	Included in construction budget
Follow-up public consultation	Included in PMO and PIS budget
Operation phase	
Monitoring of technical condition of facilities and traffic safety	From budget of relevant authorities
Total EMP costs	**13,700**

X. CONCLUSIONS AND RECOMMENDATIONS

630. This report assessed various existing environmental parameters in and around the Tranche 3 subcenters and the actions planned to minimize any significant negative impact.

631. The Tranche 3 subcenters are not located near any sensitive areas as well no significant historical and cultural areas. The project will not cause any significant adverse environmental impacts during construction of road, utility lines and buildings. No endangered or protected species of flora or fauna are reported at any of the subproject sites.

632. Environment impact analysis have been done with various criteria like demographic factors, climate and natural habitat, community and employee health and safety etc. based on the impact analysis. It was found that there is no adverse impact on any natural existing land resources nor will affect the regular life of people resident in the subproject area. The environment impact is limited to the extent of construction phase and can be mitigated through a set of recommended measures and adequate provision for environment and social impact which cover monitoring, measuring and mitigation.

633. The project risks related to environment include: (iii) the 24 hour daily work normally expected from contractors in UB poses risk for noise at night time to exceed standard limits; (iv) higher dust and noise levels, which might exert disturbance on local communities; (v) increased traffic congestion, which poses risks for longer travel time, longer delivery of people, goods and services; (vi) health and safety risk, which pose risks to the lives of communities and construction workers; and (vii) the significant demand for aggregate materials which poses risks for illegal quarries/extraction of aggregate materials.

634. The current practice of manual transport of household water from local kiosks must receive maximum protection so that no water supply to any household is disrupted for a single day and children manually transporting canned water from the local kiosks are provided with pedestrian access and traffic safety. The automobile markets in Sharkhad subcenter will require mitigation measures to prevent disturbance to normal operation of local businesses. Acquisition of land will be required from the surrounding communities for construction of new roads and community development center buildings. A separate LARP was prepared for Tranche 3 which provides details on resettlement and compensation. Ensuring traffic safety on the ger area roads during the construction phase will be an important aspect of EMP implementation.

635. Most of the project impacts are expected to be limited to the construction phase and will therefore be temporary in nature. All environmental and social impacts are manageable and can be managed cost effectively. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for subcomponents have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access locations. The construction drawings for each facility will be designed to bypass important underground utilities water supplies and resources nearby any sensitive ecological areas. Regular monitoring of the recommended mitigation measures shall also be carried out during the implementation phase of the project. EMP includes appropriate measures for mitigating all environmental impacts associated with operations of the facilities.

636. EMP and Environment Monitoring Plan has been prepared and provided in Chapter 9 of this report. Public consultations were carried out in June 2019. The EMP provides impact mitigation plans, environmental monitoring plans, and specifies the institutional responsibilities and capacity needs for the environmental management of Tranche 3. The EMP will need to be reviewed and updated at the detailed design phase to ensure that EMP fully addresses the potential impacts of the final sub-component designs. Based on the environmental assessment and surveys conducted for the project, the potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified in the EMP.

637. Proper GRM will have to be implemented by the PMO to overcome public inconvenience during the proposed project activities.

638. The new buildings (community development centers and kindergartens) will generate waste during its operation that can be managed properly following to EMP.

639. An Emergency Response Program (ERP) will be prepared by Civil work contractors in consultation with Environment safeguard specialist of the PMO. ERP training will be provided to all stakeholders in the project construction and operations stages.

640. The potential cumulative and residual impacts of the sub-components as a whole indicate the project classifies as a Category “B”, in accordance with ADB’s Safeguards Policy Statement 2009 and MET Guidelines of Mongolia. Thus, IEE report has been prepared for the project. Thus, a full Environmental Impact Assessment (EIA) for the project is not required. The project is not considered highly sensitive or complex.

XI. APPENDICES

Appendix 1. National Air Quality Standard MNS4585:2016 and World Health Organization Air Quality Standard

Parameter	MNS 4585:2016 (mg/m^3)		EHS Guidelines. World Health Organization Air Quality Guidelines Global Update 2005)-µg/m^3)	
SO2	24-hour	50	24-hour	125 (Interim target-1)
				50 (Interim target-2)
				20 (guideline)
	20 minute	450	10 minute	500 (guideline)
	1-year	20		
NO2	1-year	40	1-year	40 (guideline)
	24-hour	50	24-hour	-
	20-min	200	1-hour	200 (guideline)
Particulate Matter 10	1-year	50	1-year	70 (Interim target-1)
				50 (Interim target-2)
				30 (Interim target-3)
	24-hour	100	24-hour	150 (Interim target-1)
				100 (Interim target-2)
				75 (Interim target-3)
				50 (guideline)
Particulate Matter 2.5	1-year	25	1-year	35 (Interim target-1)
				25 (Interim target-2)
				15 (Interim target-3)
				10 (guideline)
	24-hour	50	24-hour	75 (Interim target-1)
				50 (Interim target-2)
				37.5 (Interim target-3)
				25 (guideline)
CO	Average in 1 hour	30g/m^3		No standard

Appendix 2. National Noise Standards MNS 4585:2016 and World Health Organization Noise Standard

Receptor	MNS 4585:2007		EHS Guidelines (Guidelines for Community Noise. World Health Organization, 1999)	
Residential, Institutional, Educational	07 00 - 23 00	60 dB(A)	07 00 - 22 00	55 dB(A)
	23 00 - 07 00	45 dB(A)	22 00 - 07 00	45 dB(A)

Appendix 3. National Surface Water Quality Standard MNS 4586:1998

Parameter	Measuring unit	MNS 4586:1998
pH		6 5-8 5
DO	mg/l	not less than 6 and 4
BOD	mg/l	3
NH4*N	mg N/l	05
NO2*N	mg N/l	0 002
NO3*N	mg N/l	9
PO,-P	mg P/l	0.1
A	mg/l	300
F	mg/l	1.5
SO4	mg/l	100
Mn	mg/l	0.1
Ni	mg/l	0.01
Cu	mg/l	0.01
Mo	mg/l	0.25
Cd	mg/l	0.005
Co	mg/l	0.01
Pb	mg/l	0.01
As	mg/l	0.01
Cr	mg/l	0.05
Cr6+	mg/l	0.01
Zn	mg/l	0.01
Hg	mg/l	0.1
Oil	mg/l	0 05
Phenol	mg/l	0 001
Active and washing substances	mg/l	01
Benzipyren	Mkg/1	0 005

There are no comparable EHS guidelines in this regard.

* DO >6 mg/l for summer time and DO »4 mg/1 for winter time.

Appendix 4. National ground water quality standard MNS 900-2005 and World Health Organization Standards

Parameter	MNS 900:2005		World Health Organiation Guidelines for Drinking Water Quality, Fourth Edition. 2011	
Na-	mg/l	200		None established
K-	mg/l	200		None established
Ca2'	mg/l	100		-
Mg2-	mg/l	30		-
SO42	mg/l	500		None established
HCO3	mg/l	-		-
CO32	mg/l	-		-
Cl	mg/l	350	mg/l	5
P	mg/i	0 7-1.5		-
Br		-		None established
Test, by mark	mg/l	2		-
Color	degree	20°		None proposed
Odor	mark	2		-
pH		6.5-8.5		None established
Electric Conductivity Y S/st		-		-
General Minerals		1,000		-
Hardness	mg-eqv/l	7		None established
Acidity potential	mB			-
Solid remains	g/l	1		-
NH4	mg/l	1.5		None established
NO3	mg/l	50	mg/l	50
NO2	mg/l	1	mg/l	3
PO4	mg/l	35		-
As	mg/l	001	mg/l	001
Fe	mg/l	0.3		None established
Pb	mg/1	003	mg/l	001
Ni	mg/l	002	mg/l	007
Cr	mg/l	005	mg/l	005
Cu	mg/l	0.1	mg/l	2
Zn	mg/l	5		None established
Mn	mg/l	0.1		None established
Cd	mg/l	0003	mg/l	0003
Hg	mg/l	00005	mg/l	0006
B	mg/l	0.5	mg/l	24
Ba	mg/l	0.7	mg/l	07
Mo	mg/l	007		None established
Se	mg/l	001	mg/l	004
E coli or thermo tolerant coliform bacteria		*		Must not be detectable in any 100 ml sample

MNS 0900:2005. Drinking Water Hygienic Requirement and Quality Control is the standard used for groundwater supply, which is the source for drinking water supply in Mongolia.

Appendix 5. National Soil Quality Standard MNS 5850-2008

Parameter	MNS 5850:2008			
	Soil Mechanical Composition			Maximum Allowed Level *
	Clay	Loamy	Sandy	
Pb	100	70	50	100
Cd	3	1.5	1	3
Hg	2	1	05	2
As	6	4	2	6
Cr	150	100	60	150
Cr6+	4	3	2	4
Sn	50	40	30	50
Sr	800	700	600	800
V	150	130	100	150
Cu	100	80	60	100
Ni	150	100	60	150
Co	50	40	30	50
Zn	300	150	100	300
Mo	5	3	2	5
Se	10	8	6	10
B	25	20	15	25
F	200	150	100	200
CN	25	15	10	25

* There are no soil quality International standards for EHS guidelines.

Appendix 6. National Boiler Emission Standard MNS 6298:2011 and EHS Guidelines

Guideline	Parameter in mg/Nm^3)			
	MNS 6298:2011		EHS Guidelines *	
SO2	mg/m^3	400 urban 600 remote areas	mg/Nm^3	2000
NOx	mg/m^3	450-1.100 based on volatile coal	mg/Nm^3	650
Particulate Matter	mg/m^3	50-200	mg/Nm^3	50-150

* Small Combustible facilities Emission Guidelines (3 MWth-50 MWth) - for Boilers using solid fuel; MWth - Megawatt thermal; Nm^3 is at one atmospheric pressure. 0°C

Appendix 7. National Standard on Wastewater Discharge to Effluents (MNS- 4943-2011)

№	Parameter	Measuring unit	Maximum allowance	EHS Guidelines*
1	Water temperature	C	20	
2	Hydrogen ion activity (pH)	-	6-9	6-9
3	Odor	Sense	No bad smell	
4	Suspended solids (SS)	mg/l	50	
5	Biochemical Oxygen Demand (BOD)	mg/l	20	30
6	Chemical Oxygen Demand (COD)	mg/l	50	125
7	Permanganate	mg/l	20	
8	Dissolved Salt	mg/l	100	
9	Ammonia Nitrogen (NH4-N)	mg/l	6	
10	Total Nitrogen (TN)	mg/l	15	10
11	Total Phosphorous (TP)	mg/l	1.5	2
12	Organic Phosphorous (DOP)	mg/l	0.2	
13	Hydrogen Sulphide (H2S)	mg/l	1	
14	Total Iron (Fe)	mg/l	1	
15	Aluminum (A)	mg/l	0.5	
16	Manganese (MN)	mg/l	0.5	
17	Total Chromium (Cr)	mg/l	03	
18	Chromium +6 (Cr+6)	mg/l	Not specified	
19	Total cyanide (CN)	mg/l	0.05	
20	Free cyanide (CN)	mg/l	0.05	
21	Copper (Cu)	mg/l	0.3	
22	Boron (B)	mg/l	0.3	
23	Lead (Pb)	mg/l	0.1	
24	Zinc (Zn)	mg/l	1.0	
25	Cadmium (Cd)	mg/l	0.03	
26	Antimony (Sb)	mg/l	0.05	
27	Mercury (Hg)	mg/l	0.01	
28	Molybdenum (Mo)	mg/l	0.5	
29	Total Arsenic (As)	mg/l	0.01	
30	Nickel (Ni)	mg/l	0.2	
31	Selenium (Se)	mg/l	0.02	
32	Beryllium (Be)	mg/l	0.001	
33	Cobalt (Co)	mg/l	0.02	
34	Barium (Ba)	mg/l	1.5	
35	Strontium (Sr)	mg/l	2	
36	Vanadium (V)	mg/l	0.1	
37	Uranium (U)	mg/l	0.05	
38	Mineral oil	mg/l	1	
39	Fat oil	mg/l	5	
40	Surface active agents	mg/l	2.5	
41	Phenol (C5H20H)	mg/l	0.05	
42	Thrichloretilen	mg/l	0.2	
43	Tetrachloretilen	mg/l	0.1	
44	Remained chlorine (Cl)	mg/l	1	
45	Faecal conforms	No/100ml	Not occurring in 1 ml.	400 MPN/100ml

* Based on IFC Standards for Hospital Effluents in Annexure 2

Appendix 8. Environmental Mitigation Measures Plan

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
A. Management of common impacts of all subcomponents for Tranche **3**								
1. Pre-construction and Detailed Design Phase								
Confirmation of required resettlement and compensation	Grievance or impacts on livelihood	1. Affected households well informed prior to implementation of Tranche 3 2. Land Acquisition and Resettlement Plan to be prepared and approved by EA and ADB	All affected persons in the subcenters	Before project implemented	See LARP	See LARP	PMO/MUB	LARP committees
Disclosure and engagement of community	Community awareness	1. Public awareness campaign 2. Initiate Information Disclosure and GRM	For all construction sites	At the start of design phase	Annual EMR, next Public Consultation Report	Included in PMO budget	PMO	PMO/PIS
Obtaining necessary approvals from relevant authorities	Compliance to domestic regulations	1. DEIA for Tranche 3 is prepared and approved by MET 2. Obtain necessary permits and certificates from relevant authorities.	For both subcenters: Sharkhad and Tolgoit	Before commencement of construction	As required PMO report	No additional cost	PMO/MET	PIS-ES
Preparation of Detailed Designs of Tranche 3	Minimizing negative environmental and social impacts	Work with PIS to complete detailed designs of the subcomponents in each subcenter. Ensure that following measures are undertaken: a) Identification of spill management plan and Emergency response plan for all construction sites b) Careful planning and scheduling of implementation of construction packages to prevent compounded (cumulative) disturbances and impacts. c) Ensure no disturbance or damage to cultural property and values d) Avoid unnecessary cutting of trees if possible e) Locate any required aggregate borrow pits away from human	project area of influence	During the design period	Detailed Design documents for Tranche 3	Included in detailed design budget	PMO	Detailed Design Consultant Team

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		settlement with fencing and access barriers f) Ensure that no disruption to water supply activities of the local households from kiosks and wells g) No disruption to normal pedestrian and vehicle traffic along all roads in the subcenters by providing alternate deviation/temporary routes h) Ensure local residents, entities and merchants are informed and notified of construction activities and schedule to minimize disturbance on normal commercial activities and livelihood of households. i) Review measures to prevent or minimize disturbances to all ger area schools, kindergartens and social centers j) 110 KW power of electricity transmission air-line from 3rd Thermal power plant to Bornuur sub province as well as “PRP-110” to “Geo” substations transit through south western and southern part of the the Tolgoit subcenter respectively, therefore, protection zone of these lines shall be considered during the detail design. k) Careful preparation of Drainage Plan which provides mitigation measures for soil water at earthwork sites for both subcenters. The detailed design consultant shall ensure that the planned roads constructed within the project shall have drainage/trenches to remove rainwater on both sides of the road. l)For road drainage infrastructure in Tolgoit, a more nature-based “sponge”						

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		infrastructure be utilized in place of traditional non-porous construction. This will slow down water speeds, increase the re-use of storm water to maintain green spaces with related cooling, dust control and erosion control. Maximizing use of rapidly diminishing water resources wherever possible is necessary.						
Update of EMP for Tranche 3	Incorporation of more details and site-specific information	a) Review finalized alignments for all utility pipelines and new roads to minimize impact on adjacent properties and surrounding environment b) Review measures to ensure impacts on existing local drainage channels are minimized c) If any unanticipated potential impacts arise, ensure it will be included in the updated EMP d) Confirm solid waste disposal destination with relevant district authorities (Narangiin Enger for Tolgoit subcenter and Ulaanchuluut for Sharkhad subcenter). e) Update mitigation measures and monitoring requirements in the EMP where necessary to meet features of the detailed designs and to protect affected sites f) Submission of updated EMP which reflects features in detailed design and cost updated to ADB for review and approval g) Contractor prepare site-specific EMP's which include mitigation measures for following aspects: i. Construction drainage ii. Soil erosion iii. Noise and dust iv. Contaminated spoil	All construction sites and subcomponents	Before commencement of construction	Updated EMP for Tranche 3	Included in PIS budget	PMO/Design consultant	PIS-ES

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		disposal v. Solid and liquid waste management vi. Traffic safety vii. Utility and power disruption viii. Worker and community H&S ix. Site restoration plan x. Transport and storage of construction materials xi. Cultural chance finds						
Interference with drainage patterns	Temporary flooding hazards	Appropriate siting.	All construction sites and subcomponents	During the design period	Updated EMP for Tranche 3	Included in detailed design budget	PMO/PIS	Detailed Design Consultant Team
Temporary use of land	Inconvenience for local residents	The construction company shall ensure selection of temporary lands for mobilization does not infringe upon adjoining residential areas, water bodies, natural flow paths, and access roads to garages, and other amenities in the area and potentially affected households are consulted and agreed.	All sites required for storing, parking and other purposes	Before mobilization of construction equipment and workforce	Monthly contractor Report	Included in construction budget	PMO/PIS	Civil works contractor
Obtain approval on construction waste disposal site	Compliance to domestic regulations on waste disposal	Notify relevant departments of MUB and District authorities to confirm locations of borrow pits and disposal landfill sites for construction of Tranche 3 and obtain required permits.	Ulaanchuluut and Narangiin Enger landfill sites	Before commencement of construction	As required PMO report	No additional cost	PMO/MUB/ District authorities	PIS-ES
Design the sequence of civil works	Repeated excavations	The PMO civil engineers (full time employees of PMO) will design the sequence of various civil works at different sites and make arrangements to avoid repeated excavations.	All civil works	Before commencement of construction	As required PMO	No additional cost	MUB	PMO engineers
Prepare bid documents for civil works	Inclusion of environmental requirements	Ensure the updated EMP is included in tender documents for civil works and the civil works contractors are required to prepare site specific EMP Specify in tender documents that the civil works contractor shall have	All subcomponents of Tranche 3	Before announcement of the bidding	All tender documents including TOR	Included in PIS budget	ADB/PMO/SRA	PIS/Tender company

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		experienced personnel to prepare and implement SEMP.						
Create awareness of physical cultural resources in the project area	Compliance to relevant regulations	PMO/PIS to review potential locations of physical cultural resources and prepare Chance Finds Procedure for unexpected discoveries.	For both subcenters: Sharkhad and Tolgoit	Before commencement of construction	As required PMO report	Included in construction budget	PMO/PIS	Civil works contractors
Obtain necessary permits for construction	Compliance to domestic regulations	Contractors to comply with all statutory requirements set out by domestic regulations for use of construction equipment, and operation of construction plant such as concrete batching.	For all construction sites	Before commencement of construction	As required PMO report		PMO/SRA	Civil works contractors
Capacity building	Awareness, understanding and preparedness	Prepare capacity building training plan and schedule for construction workforce and supervision engineers in order to ensure all construction staff has clear understanding of EMP implementation requirements. Prepare training plan for PMO/PIS-ES to ensure proper implementation of EMP and management of environmental works.	All construction workforce and relevant PMO/PIS staffs	Before commencement of construction	Training report		PMO	PIS/Contractors
Recruitment of construction workforce	Labor migration and spread of infectious diseases	Hire local UB workers as much as possible, thereby reducing number of migrant workers from other regions of the country.	Construction workforce	Throughout construction phase	Worker hiring stages in procurement plan	No additional cost	PMO	Contractors
2. Construction Phase of Tranche **3**								

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Operation of workers camps	Pollution to surrounding environment	Locate workers camp away from human settlements Provide adequate housing and waste disposal facilities such as pit latrines and trash bins A solid waste collection point shall be provided and ensure a tidy campsite Provide drainage for workers camp if necessary All campsites must be provided with kitchen, canteen and rest rooms Camp areas will be restored to original condition after construction is completed	Any temporary worker camp or staging area	Throughout construction phase	Monthly contractor reports	Included in the construction budget	PMO/ PIS	Contractor
	Discipline related issues	Implement internal discipline rules for workers camp which prohibits alcoholic drinks and set out harmonious behavior All construction workers shall be attended at H&S training induction which includes subjects on infectious and sexually transmitting diseases						
Operation of borrow pits	Pollution and injury risks, compliance to restoration standards	Location of borrow pits shall be well planned to minimize any disturbance on settlement areas and potential impacts on environment. All borrow pits shall be located at least 500m away from surface water body, cultural heritage or forest. Obtain permission for all borrow pit locations from relevant district governor. Borrow pits shall have access barriers and warning sign or visibility fencing if necessary. Execute rehabilitation at borrow pits after completion of use according to domestic standards.	All borrow pits	Throughout construction phase	Monthly contractor reports	Included in the construction budget	PMO/PIS	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Transport of construction materials, and storage of materials on site	Emission of dust and noise, traffic accident, waste pollution	Prepare transport plan and schedule for construction materials including fabricated materials and extract materials from borrow pits Safe handling/storage rules to be prepared All transportation trucks shall be covered with tarpaulin Piles of aggregates at sites shall be used/or removed promptly, or covered and placed in non-traffic areas Stored aggregates shall be away from settlements, cultural sites and ecological receptors. Bitumen batch plants and handling areas shall be isolated from subcenters.	All construction sites, vehicles and storage areas	Throughout construction phase	Monthly contractor reports	Included in the construction budget	PMO/PIS	Contractor
Asphalt production and pavement works	Air pollution, soil contamination due to spills	Contractors shall be trained with safety handling procedures on production, handling and application of bitumen. In case of spill, the contaminated soil shall be peeled off and neutralized as per Spill Management Plan. Necessary tools of spill management shall be available at asphalt production sites. Bitumen shall be stored in designated areas with any any surface water body or human settlement nearby Bitumen shall not be used as fuel Empty bitumen boxes shall be transported to approved landfill sites	Asphalt production and bitumen storage sites	Throughout construction phase	Monthly contractor reports	Included in the construction budget	PMO/PIS	Contractor
Spoil management	Contamination of soil, surface water	Spoil shall be stored in stockpiles at the approved locations only Prohibit spoil disposal on sloped surface, nearby cultural site of any sensitive receptor. Where possible, spoil shall be used for rehabilitation of borrow pits	All excavation areas	Throughout construction phase	Monthly contractor reports	Included in the construction budget and monitoring budget	PMO/PIS	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		Type, volume, source and removal of spoil materials shall be recorded. Contaminated spoil materials shall be neutralized and displaced to approved landfill sites. Suspected contaminated soil must be tested before being disposed to landfill sites						
Generation of solid waste	Physical pollution to surrounding environment	Solid waste shall be collected and temporarily stored at a designated place protected with fencing Contract with local urban service agency to transport collected solid waste to the approved landfill sites on weekly basis Place trash bins at all construction and workplaces	All construction sites and worker camps	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/PIS	Contractor
Generation of liquid waste	Pollution to soil and surface water	Wastewater from workers camp shall be collected in designated steel tanks Sign agreement with local urban service agency to transport waste water to centralized WWTP of UB city on monthly basis						
Generation of hazardous waste	Harm to human health and pollution to environment	Collection, storage, transport and disposal of hazardous waste such as used oil, gasoline, paint and other toxics shall follow relevant regulation of Mongolia and shall be disposed to approved places appointed by the government.						

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		Waste classification by type (e.g., hydrocarbons, batteries, paints and organic solvents) Hazardous waste must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, surface water bodies, human settlements or any other sensitive receptors.						

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Dust emission from various construction activities	Dust disturbance	During dry and windy days when it's not raining and dust level goes up, it is recommended a sprinkling of water with norm 2-4 liters per square meter at the active earthwork and construction sites 3-4 times a day. Soil stockpiles at the active earthwork sites, including trenches digging sites for utility pipelines, road construction sites and foundation work sites for the social buildings, shall be covered in order to prevent from dust spread. Loaders of the construction trucks that transport earth materials, concrete materials shall be covered with tarpaulin in order to prevent dust spread when driving through settlement areas. Concrete trucks with mixing loader shall be washed out or cleaned their loaders and wheels when leaving mixing plants. Conduct regular site cleaning at the construction and storage sites where there might be fine dust particles, concrete crumbles and wood crumbles that might spread through the air with wind blows. Construction works, particularly concrete pavement, trenches dug and other earthworks, shall be stopped temporarily during windy days Enforce speed limit for construction vehicles on dirt roads within the subcenters The construction company shall ensure proper dust management is done to	All construction sites	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/ Power Distribution Company	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		reduce impact due to site construction dust. The Construction company shall evaluate the volume of earthworks, and must monitor dust level within 500m using appropriate equipment and ensure comprehensive dust mitigation plan						
Noise emission from construction vehicles, machineries and equipment	Noise disturbance	Maintain equipment and machineries in good technical condition Vehicles and machineries shall be turned off when not in use Erect noise barriers around excessively noisy activity areas where possible Notify surrounding community of noisy works in advance Suitable construction timing which aims to reduce disturbance on local communities will be identified. Construction activities will be stopped during night time between 20:00pm – 08:00am. Transportation of construction materials to the Sharkhad subcenters is recommended to be made on Mondays when the automobile market is closed.	All construction sites					
Disruption to public utility systems	Loss or disruption of water supply or electricity lines	Develop carefully a plan of days and location where outages in utilities and services will occur, or are expected Contact local utilities and services with schedule and identify possible contingency back-up plans for outages Notify affected community of planned outages in advance Plan outages during low use hours such as between 24:00 and 06:00 am.	All construction sites					
Construction site clearance	Damage or removal of trees	Prevent damage to roadside trees and train vehicles drivers and construction engineers	All construction sites	Throughout	Monthly contractor reports	Included in	PMO/PIS	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		If any trees need to be removed, notify local khoroo administration in advance and obtain approval Marking of any vegetation to be removed prior to clearance and strict control on clearing activities to ensure minimal clearance.		construction phase		construction budget		
Earthworks (excavation work sites)	Soil erosion	Berms and plastic sheet fencing shall be placed around all excavation and earthwork areas Earthworks shall be conducted during dry periods Maintain a topsoil stockpile for site restoration purposes Protect exposed or cut slopes with planted vegetation and have a slope stabilization protocol ready Re-vegetate all soil exposure areas immediately after work completed	All earthwork sites	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/PIS	Contractor
Civil works	Public and worker injury, accidents and health issues	Proper fencing, protective barriers and buffer zones should be provided around all construction sites and along all roadways Sufficient signage and information disclosure Implement site-specific H&S plan Speed limit for all construction vehicles and 5 second stop rules at all junctions Drinking water for construction workforce shall be provided from reliable source. In case drinking water is supplied from nearby wells, water quality testing must be applied monthly All construction workers are required to wear personal protective clothes and items at workplaces all the time In case of accident or injury or illness, apply to nearest primary health care	All construction site and workplaces	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/PIS	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		center Sufficient lighting shall be provided at all workplaces All construction sites should be examined daily to ensure unsafe conditions are removed Protected pedestrian sidewalks are provided around construction sites to ensure the access roads are not blocked by construction Demarcate additional locations where pedestrian crossings can be provided Provide construction road and walkway with lighting Safe passage to residents' houses will be provided during construction period. Detailed plan for detour and access plan shall be developed during construction stage by contractors.						
	Potential pollution to surface and ground water resources	Protective berms, plastic sheet fencing or silt curtains should be placed between all earthwork sites and any surface water bodies or wells, wherever necessary Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion Try to conduct earthworks only during dry periods Prohibit construction vehicles to enter Uliastai river basin in order to prevent from pollution No fuel recharging or machinery maintenance shall be allowed nearby Ulistai river or any ger area water wells in order to prevent from oil spills Prevention of throwing waste in flood channels or drainages	All construction sites	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/PIS	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
	Inadequate safety performance by contractors or non-compliance	Enforcement of safety rules and implementation of the prevention measures through periodic monitoring of safety performance of the contractors by PMO, supervision engineers and external monitoring team during the pre-construction and construction phases.	All construction packages	Weekly, during the construction phase	Monthly contractor report, annual EMR	Included in PMO and supervision budgets	PIS/external monitoring team	PMO, supervision consultants
Transportation and traffic	Traffic and pedestrian safety issues, accidents	Schedule transportation activity during light traffic hours. Create adequate traffic detours, sufficient signage and warning lights. Post speed limits and construction vehicles strictly follow deviation routes appointed by the contractor. Inform local community of construction traffic areas in advance Protected pedestrian sidewalks are provided around construction sites to ensure the access roads are not blocked by construction Demarcate additional locations where pedestrian crossings can be provided Provide construction road and walkway with lighting	All construction sites and construction vehicles	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/ Supervision consultant	Contractor
Implement construction drainage sub plan	Loss of drainage and flood storage	Install culverts under the project constructed roads to allow flood flows. Manage to not allow borrow pits to be backfilled without pumping the water left inside the pits. Provide temporary drains or ditches for construction sites to prevent from flood events	All areas near stream	Design and construction phases	Monthly contractor reports	Included in construction budget	PMO/ Supervision consultant	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Chance finds	Damage to cultural property or values	In case of chance finds occur, the construction works at that spot shall be stopped immediately until further clearance Notify local district administration, PMO and Institute of Archaeology of the chance finds Work at the find site will remain stopped until PMO and relevant district authorities allow work to continue.	All earthwork sites	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/ Supervision consultant	Contractor
Construction and excavation of flood protection channels	Sedimentation of existing primary drainage channels, disturbance to local households	Temporary earthen berms or plastic fencing need to be installed along excavation areas to contain loose soil prevent erosion of downstream main flood channels. Physical barriers such as fencing should be placed between civil work sites and adjacent households and businesses.	Along all flood prevention sites	During earthwork activities	Monthly contractor reports	Included in construction budget	PMO/ PIS	Contractor
Electrical / fire safety equipment	Sparks and fire hazard during construction	Recording of all electric fittings and fire safety devices located within secure casings	All construction sites	Throughout construction phase	Monthly contractor reports	Included in construction budget		
Use of volatile organic compounds	Toxicity and air contamination inside building	Use of low or no volatile organic compounds - water based non-toxic etc.			Monthly contractor reports	Included in construction budget		
Oil spillage due to construction vehicles	Contamination of soil, surface water	Prepare and implement Spill management plan to ensure that all fuel, oil and chemicals are stored in 100% bundled area with impermeable floor. Ensure all vehicles in in good technical condition by frequently conducting technical inspection Ensure neutralizing tools are in place in case of oil spills	All construction vehicles	Throughout construction phase	Monthly contractor reports	Included in construction budget	PMO/ Supervision consultant	Contractor

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
3. Operation Phase of Tranche 3								
Operation of new roads	Traffic safety Increased emission of pollutants	Ensure well marked safe speed limits are enforced and installation of speed bumps at necessary locations determined by the MUB Traffic Office All vehicles that use the road are required to be in technically good condition	Along the new roads	Regularly	Annual Roads Dept. Report	Included in Operation management costs	MUB Road and Traffic Department	
	Improved infrastructure and new roads will lead to increased traffic emission and traffic safety concerns	Traffic Department of MUB will ensure that traffic signs, speed bumps and pedestrian crossings are provided in the area.						
Operation of new utility lines	Risk of equipment failure leading to spills, or system outages	Regular inspection and maintenance of the utility conduits, substations, pipelines and equipment.	Along all utility lines and substations	Regularly	Annual USUG report		USUG	
	Connection to the centralized water supply and wastewater might lead to increased water consumption and wastewater generation in	USUG will be responsible operational efficiency for water supply and wastewater infrastructure for the areas who will place control on water demand and supply balance.				Included in Operation management budget		

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
	the project areas							
Operation of electrical safety systems, fire safety systems at new buildings	Electric sparks, fire and explosion	Record of all electrical switchbox located within secure casings	All new buildings	Regularly	Annual PMO report		PMO	Operation engineers
Generation of solid waste from new buildings	Physical pollution and nuisance to local community	Training of personnel in proper waste management procedures. Operational entities will sign waste removal agreement with relevant district urban service agencies.		Regularly			PMO/PIS	Operation entities of new buildings
Health and safety and emergency response	Lack of awareness of H&S procedure	Training of personnel on safety and emergency response in compliance with requirements by Emergency Agencies of relevant districts		Regularly				
B. Management of Impacts Specific to Subcomponents of Tranche **3**								
1. Construction of New Roads								
Construction of news roads	Disruption to traffic movement, disturbance on pedestrian sidewalks	1. Provide temporary and access roads and erect information boards and warning signs at construction sites 2. Protected sidewalks for pedestrian access to their homes and service outlets	New roads	During the construction	Monthly contractor reports	Included in construction budget	PMO/ PIS	Contractors

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		3. Civil works must be scheduled to not disrupt the local traffic during its peak hours		between 08:00-09:00am and 17:00 – 18:00pm				
2. Construction of Utility Pipelines								
Construction of utility pipelines	Dust disturbance on surrounding receptors, pedestrians falling in the channels, disruption to existing pipelines / cable lines	1. Earthworks conducted with physical barriers and sound barriers 2. Channels dug for pipelines shall be protected with fencing nearby bus stations, service outlets and adjoining access roads 3. Construction works planned not to disrupt or cause damage to existing pipelines and contractors shall be well aware of alignment scheme of existing pipelines prior to commencement of construction	Heating, water supply, sewerage and power lines	During the construction	Monthly contractor reports	Included in construction budget	PMO/ USUG	Contractors
3. Construction of social buildings								
Construction of social service buildings	Blocking of access roads, noise disturbance on neighboring households	1. Provide temporary access roads for local residents' cars and protected pedestrian sidewalks 2. All new building construction sites shall have protection fencing and noise insulation barriers such as sheet fencing	New buildings for school, kindergarten, business incubator, sports complex, social development center	During the construction	Monthly contractor reports	Included in construction budget	PMO/ PIS	Contractors
4. Flood Control Measures								

Project Activity	Potential Impacts / issues	Proposed Mitigation Measures	Apply to	Time frame	Activity Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Construction / excavation of flood protection channels	Sedimentation of existing drainage channels Disturbance of local households	1. Temporary earthen berms, or plastic fencing need to be installed along excavation areas to contain loose soil prevent erosion of downstream main flood channels. 2. Use pipelines to remove water drained from topsoil layers during the earthworks. 3. Physical barriers such as sheet fencing should be placed between civil works sites and adjacent homes and businesses.	Flood channels	During the construction	Quarterly contractor reports	Included in construction budget	PMO/ USUG	Contractors
5. **Management of medical waste**								
Operation of the primary health center at Tolgoit	Generation of medical waste that may be hazardous to human health	1. Medical waste such as syringes, bandages, etc. are collected on regular intervals by Element LLC is the sole licensee having obtained special license on handling medical waste from the Ministry of Health to collect medical waste in Mongolia. They have a medical waste facility at Ulaanbaatar city's central dumpsite called Narangiin Enger. 2. Management of medical waste by the PHC will strictly follow the "Regulation on classifying, collecting, storing, transporting, recycling and disposing of hazardous medical waste" which was adopted with Order No. A/505 of Minister of Health, December 2017.	All medical waste of the PHC at Tolgoit	During operation period	Monthly PHC report to MOH	Included in operation budget of PHC	Health department of MUB, MOH	PHC management

Appendix 9. Environmental Monitoring Plan

Environmental and social component	Parameters	Location	Means of monitoring / relevant standards	Frequency	Responsibility		Estimated cost (USD)	Budget source
					Supervision	Implementation		
Pre-construction phase - Update baseline environmental conditions								
Review environmental baseline	Existing sensitive areas and monitoring spots	For both subcenters	Field survey, consultation with local community	Once	PMO	PIS	$600	PMO budget
Air quality (baseline development)	PM10, PM2.5, SO2, NO2, CO	At 2 spots in both subcenters (4 spots in total)	MNS4585:2016. Air quality. General Technical Requirements	Once	PMO/PIS	Licensed Institute	$400	PMO budget
Noise level	Ambient noise level (dB)		MNS4585:2007. Ambient noise level. Technical requirements	Once	PMO/PIS	Licensed Institute		PMO budget
Surface water quality (baseline development)	TSS, DO, BOD, heavy metals, turbidity, hardness, oil & grease and other chemical elements	Uliastai river in Sharkhad subcenter	National water quality standards MNS5668:2006 MNS4586:1998 MNS6148:2010 MNS0900:2005	Once	PMO/PIS	Licensed Institute	$200	PMO budget
Ground water quality (baseline development)	TSS, DO, BOD, heavy metals, turbidity, hardness, oil & grease and other chemical elements	At selected ger area wells that area close construction sites		Once	PMO/PIS	Licensed Institute	$400	PMO budget
Soil quality (baseline development)	Heavy metals contamination analysis, oil and grease	At 2 spots in both subcenters (4 spots in total)	National soil quality standard MNS5850:2008	Once	PMO/PIS	Licensed Institute	$400	PMO budget
	Inventory of present and past land uses that could cause contaminated soil	At all excavation sites	Using field and analytical methods approved by MET	Once	PMO/PIS	Licensed Institute	$300	PMO budget
Construction phase of all subcomponents of Tranche **3**								

Environmental and social component	Parameters	Location	Means of monitoring / relevant standards	Frequency	Responsibility		Estimated cost (USD)	Budget source
					Supervision	Implementation		
Air quality (baseline development)	PM10, PM2.5, SO2, NO2, CO	At 2 spots in both subcenters (4 spots in total)	MNS4585:2016. Air quality. General Technical Requirements	Quarterly during the construction period	PMO/PIS	Contractor subcontract with local licensed institutes	$1,600	Included in construction budget
Noise level	Ambient noise level (dB)		MNS4585:2007. Ambient noise level. Technical requirements					
Surface water quality (baseline development)	TSS, DO, BOD, heavy metals, turbidity, hardness, oil & grease and other chemical elements	Uliastai river in Sharkhad subcenter	National water quality standards MNS5668:2006 MNS4586:1998 MNS6148:2010 MNS0900:2005				$1,600	
Ground water quality (baseline development)	TSS, DO, BOD, heavy metals, turbidity, hardness, oil & grease and other chemical elements	At selected ger area wells that area close construction sites					$1,600	
Soil quality (baseline development)	Heavy metals contamination analysis, oil and grease	At 2 spots in both subcenters (4 spots in total)	National soil quality standard MNS5850:2008				$800	
Waste Management	Monitoring of waste management	Workers campsites, construction sites, temporary waste collection points	Waste management plan, relevant domestic regulations	Monthly during the construction period	PMO/PIS	Contractors	$800	
Health and safety	Worker H&S monitoring: use of PPE, workplace lighting, warning signs, H&S induction, traffic safety	Workers campsites, construction sites	Health and safety standards of Mongolia					

Environmental and social component	Parameters	Location	Means of monitoring / relevant standards	Frequency	Responsibility		Estimated cost (USD)	Budget source
					Supervision	Implementation		
	Community H&S monitoring: traffic rules, traffic signs, protection fencing etc.	At all construction sites						Included in construction budget
Impact on local community	Monitoring of GRM implementation: grievance received, results of construction phase consultation, corrective actions, availability of GRM entry points	Both subcenters	GRM implementation plan in IEE	Quarterly during the construction period				
Operation phase								
Traffic safety	Incidence of traffic accidents and pedestrian injury reports	All new and existing roads in the subcenters	Community and police reporting	Continuous	PMO/Traffic Dept. of MUB	Traffic police and relevant khoroos	Included in budget of relevant authorities	Budget of relevant authorities
Technical condition of the project facilities	Technical good condition of utility lines to ensure no spills and outage occurrence	Utility lines: hating, water supply and sewerage pipelines	Supervision engineering report	Quarterly	PMO/USUG	Supervision engineers		
	Culverts under the new roads: blocked with sedimentation	New roads			PMO/ Traffic Dept. of MUB			
Total environmental monitoring cost:							**$8,700**	

Appendix 10. Environmental Safeguard Clauses for Civil Works Contracts

Objectives. The main objectives of the Contractor's EMP is to define impact mitigation and monitoring measures to be carried out during the construction phase. Additionally, C-EMP sets out responsible personnel in charge of implementation of the mitigation measures and handling of daily environmental issues, environmental monitoring measures and responsible persons and the Contractor's overall control on construction activities to ensure compliance to the C-EMP.

Requirements on C-EMP. The C-EMP shall be prepared in line with following methodologies and project documents: i. EIA regulation which was adopted with Environmental Minister's Order No. A-05 dated 06 January 2014; ii. The "Regulation on preparing, reviewing, approving of EMP" which was adopted with Environmental Minister's Order No. A/618 dated 29 October 2019; iii. Initial Environmental Examination (IEE) Report for Project 2; and iv. Domestic DEIA report and EMP approved by MET. A template for C-EMP is provided in Appendix 6-1.

Reporting. The contractor is obliged to submit following documents to the Program Management Office (PMO).

- The Contractor shall submit draft C-EMP within 10 days of contract signing and the finalized version of C-EMP within 28 days of contract signing, respectively.
- The contractor shall submit C-EMP implementation progress report within September 20th of every year during the contracted period and C-EMP completion report within 15 days after completion of the construction work.

Contractor's environmental personnel. The contractor is required to hire an on-site environmental specialist throughout the contracted period. The Contractor's environmental specialist shall be a qualified professional who meets criterions set out in below table. The Contractor may contract with a professional environmental firm to perform the environmental specialist's duties.

Position	Qualifications
On-site environmental specialist	• Bachelor's degree in environmental fields • At least 2 years of work experience in environmental sector • Work experience as environmental specialist or environmental consultant in similar projects is preferred • In-depth knowledge of domestic environmental laws, regulations and standards • Previous experience in preparation of EMP and implementation report

Contractor's on-site environmental specialist will perform following duties:

- Prepare C-EMP in line with the Project 2 IEE, EMP, domestic DEIA report and other relevant domestic laws, regulations and methodologies;
- Implement impact mitigation measures specified in the C-EMP at all construction sites;
- Apply and obtain necessary environment related permissions for the construction work to start and proceed with;
- Handle daily environmental issues at the the construction sites and the workers' camp sites;
- Prepare C-EMP implementation progress and completion reports and make necessary revisions in the reports in accordance with comments provided by the PMO;
- Perform other duties and tasks required by the PMO.

Environmental compliance and responsibility. In case the Contractor fails to perform environmental duties set out in this section (submission of C-EMP, implementation of mitigation measures and submission of C-EMP implementation reports) in timely manner, the PMO is entitled to take on following actions. These include:

- Provide deadline for improvement of environmental performance and compliance. An official letter will be delivered to the Contractor.
- An environmental inspection will be made by the PMO representatives to verify improvement of environmental work once the deadline is past. In case the Contractor fails to improve its environmental performance as required by the PMO, a penalty equals to 0.5%-1% of the total contract amount will be imposed.
- An environmental inspection will be made by the PMO representatives again 7 days after the penalty action. If the Contractor fails to improve its environmental performance again as required by the PMO, the inspection team may decide to stop construction works of the Contractor.
- If the Contractor fails to improve its environmental performance after the construction works are stopped, then the Client may consider options of contract termination.

Appendix 11. Table of Contents for Environmental Monitoring Report

CONTENT

Appendix 12. Environmental Site Inspection and Monitoring Checklist

Note: This form is designed for use by the Project Implementation Unit (PIU) project coordinator during site inspections and monitoring and may not be exhaustive. Modifications and additions may be necessary to suit individual sub-projects and to address specific environmental issues and mitigation measures.

Name of subcenter:_____

Location:_____

Inspection Date:_____

Inspection Time:_____

Inspector(s):_____

Inspection Item	Yes	No	N.A.	Remarks (i.e. problem observed, possible cause of nonconformity and/or proposed corrective/ preventative actions)
1. Has contractor appointed a construction supervisor and is the supervisor on-site?				
2. Is information pertaining to construction disclosed at construction site (including construction period, contractor information, grievance hotline, etc.)?				
3. Are chemicals/hazardous products and waste stored on impermeable surfaces in secure, covered areas?				
4. Is there evidence of oil spillage?				
5. Are chemicals stored and labeled properly?				
6. Is construction equipment well maintained (any black smoke observed)?				
7. Is there evidence of excessive dust generation?				
8. Are there enclosures around the main dust-generating activities?				
9. Does contractor regularly consult with khoroo administration as well as nearby residents to identify concerns?				
10. Is there evidence of excessive noise?				
11. Any noise mitigation measures adopted (e.g. use noise barrier / enclosure)?				
12. Is construction wastewater and domestic wastewater discharged to sewer systems (if possible), or are on-site treatment facilities (septic tank) provided?				
13. Is there any wastewater discharged to soil or surface water?				
14. Is the site kept clean and tidy (e.g. litter free, good housekeeping)?				

Inspection Item	Yes	No	N.A.	Remarks (i.e. problem observed, possible cause of nonconformity and/or proposed corrective/ preventative actions)
15. Are separated labeled containers/areas provided for facilitating recycling and waste segregation?				
16. Are construction wastes/recyclable wastes and general refuse removed off site regularly?				
17. Is safe supply of clean water and an adequate number of toilets provided for workers?				
18. Is personal protective equipment provided for workers?				
19. Are clear information and warning signs placed at construction sites in view of the students and staff as well as the public?				
20. Are all construction sites made secure, discouraging access through appropriate fencing?				
21. Are disturbed areas properly re-vegetated after completion of works?				
22. Were any complaints filed with the contractor, and have staff and nearby residents raised any concerns related to the performance of contractor?				
23. Any other problems identified or observations made?				

_____

Date, Name and Signature of PIU staff/ consultant

Appendix 13. Preliminary Climate Risk Screening

Country/Project Title: MON: 45007-004: Ulaanbaatar Urban Services and Ger Areas Development Investment Program (Tranche-3: Sharkhad and Tolgoit subcenters)

Sector: Urban development

Subsectors: Construction of public infrastructure, road construction

Division/Department: EARD/EASS

Screening Questions		Score	Remarks28F28F[26]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	The siting of project facilities will not be significantly affected by climate conditions. There is a small flood channel that are designed for flood control in the Sharkhad ger area which has no previous history of overflowing. Appropriate flood protection measures will be taken to prevent from flood event such as installation of culverts under the road and construction of flood barriers.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	There are no permanent surface water bodies at the subcenters.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No significant impact of projected climatic changes on construction material selection anticipated. Mongolia's very cold climate requires appropriate construction materials. Materials are locally available. Insulation materials selected for facilities will account for high temperature differences between summer and winter.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	Cost of infrastructure maintenance is increased due to cold climate. However, this is a common phenomenon in Mongolia and not a result of climate change.
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design lifetime?	0	No significant impact of weather conditions on the project's performance is anticipated.

Options for answers and corresponding score are provided below:

[26] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High):___Medium_____

Other Comments: Based on appropriate climate models for Mongolia (HadCM3 model of the HADLEY center), results show that the annual precipitation will generally increase. Precipitation in the summer season is predicted to increase by less than 10 percent. Because of climate change, it is anticipated that winters will become milder, while summer will become hotter based on overall climate change predictions. Given the very low annual average rates, the projected increase in precipitation is unlikely to affect project outputs.

Prepared by:

Appendix 14. Photos of Public Consultation Meetings

Photo 1. Public consultation meeting at the 9th khoroo of Bayanzurkh district

Photo 2. Public consultation meeting at the 19th khoroo of Bayanzurkh district

Photo 3. Public consultation meeting at the 17th khoroo of Bayanzurkh district

Photo 4. Public consultation meeting at the 22d khoroo of Bayanzurkh district

Photo 5. Public consultation meeting at the 24th khoroo of Bayanzurkh district

Photo 6. 1st khoroo of Songinokhairkhan district

Photo 7. 2d khoroo of Songinokhairkhan district

Photo 8. 3d khoroo of Songinokhairkhan district

Photo 9. 22d khoroo of Songinokhairkhan district

Appendix 15. Signed Attendance Sheets of Consultation Meetings

1st khoroo of Songinokhairkhan district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр [illegible] Дүүрэг [illegible] Хороо 1р Огноо 2019.6.20

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	Д. Норгуй	✓		тэтгэвэрт	89954465	Толгойт 64-03	[illegible]
2	Д. Балдаа	✓		тэтгэвэрт	88893482	Тол 71-5	[illegible]
3	Г. Цэрэндагва	✓		тэтгэвэрт	91886047	Т-3-28	[illegible]
4	Б. Давaa	✓		тэтгэвэрт	89855680	Толгойт 107-20	[illegible]
5	Д. [illegible]		✓	тэтгэвэрт	89954461	Толгойт 64-05	[illegible]
6	Т. Норовбаатар	✓		хувиараа	88268065	Тол-51-18	[illegible]
7	Б. [illegible]		✓	гэрт	99128489	Тол-51-12	[illegible]
8	П. [illegible]		✓	гэрт	99949943	Тол-44-659Б	[illegible]
9	Э. Наранцэцэг		✓	гэрт	96044665	Тол-84-12	[illegible]
10	М. Оргожэд		✓	[illegible]	99264495	Тол-83-07	[illegible]
11	Б. [illegible]		✓	[illegible]	99230123	Тол-84-12	[illegible]
12	Э. [illegible]		✓	[illegible]	80054290	Т-5-28	[illegible]
13	Э. Мөнгөнхан	✓		хувиараа	99017997	Т-80-02	Э. Мөнгөнхан
14	Л. [illegible]		✓	[illegible]	95102955	Т-59-39	[illegible]
15	Л. [illegible]		✓	хувиараа	88057896	Т-54-33	[illegible]
16	Т. [illegible]		✓	[illegible]	86785800	Т-42-600	[illegible]
17	Д. Амарзаяа		✓	[illegible]	88204150	Т-96-6	[illegible]
18	Б. Мөнхжаргал		+	[illegible]	88858286	Т-53-6	[illegible]
19	Ж. Даваажаргал		✓	гэрт	88056499	Т-1-14-4	[illegible]
20	И. [illegible]		✓	гэрт	88670625	Т-1-14-2	[illegible]
21	Ч. [illegible]		✓	[illegible]	99288594	Т-112-10	[illegible]
22	[illegible]		✓	[illegible]	[illegible]	Т-65 [illegible]	[illegible]
23	М. Мөнхбаяр	Эр		Толгойт [illegible]	88079810	1-41-26	[illegible]
24	Э. [illegible]		✓	[illegible] 94-3	89843059	[illegible]	[illegible]
25	Норжмаа		эм	тэтгэвэрт	80227785	Т-59-11	[illegible]
26	Ч. Нямсүх		✓	[illegible]	99886451	Т-65-17	[illegible]
27	Э. [illegible]	✓		[illegible]	99180774	Т-71-9	[illegible]
28	Б. Нармандах		+	тэтгэвэрт	88145895	Т-59-6	[illegible]
29	Ч. Сэсэрбаатар	Эр		[illegible]	88159468	Т-67-3 [illegible]	[illegible]
30	З. [illegible]		✓	[illegible]	88222950	Т-97-34	[illegible]
31	Т. [illegible]	✓		[illegible]	80922950	Т-97-34	[illegible]

Төслийн нэр [illegible] Дүүрэг [illegible] Хороо 1р Огноо 2019.06.20

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	Ж. Отгон		эм	[illegible]	96332922	СХД [illegible] 59-6	Ж. Отгон
2							

2d khoroo of Songinokhairkhan district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр: Төлөвлөлт дэд төв Дүүрэг: Сонгинохайрхан Хороо: 2 Огноо: 2019.6.21

№	Нэрс	Хүйс: Эр	Хүйс: Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Н.Нямчимэг		✓	Тэтгэвэрт	99130097	Өргөө 54-12	Нямч[illegible]
2	З. Оюунчимэг		✓	тэтгэвэрт	99819312	СХД II хороо Өргөө 52-9	З.Оюунчимэг
3	Б. Чанцалдулам		✓	Үс засвар	89630111	СХД II хороо 55-22	Чанцал
4	Дуламсүрэн		✓	тэтгэвэрт	88879633	СХД II хороо 54-25	Дулма
5	Д.Энхжаргалан	✓		Тэтгэвэрт	95226584	СХД II хороо 58-2	[illegible]
6	Б. Эрдэнэцэцэг		✓	тэтгэвэрт	89929370	СХД 2-р хороо 52-13	[illegible]
7	С. Түмэндэлгэр		✓	тэтгэвэрт	90705767	СХД II хороо 48-15	Түмэндэлгэр
8	Ю. Уранчимэг		✓	тэтгэвэрт	95595582	СХД 2 хороо 49-6	[illegible]
9	Ю. Пүрэвсүрэн		✓	ажилгүй	99247704	СХД 2 хороо 44-11	Пүрэвсүрэн
10	С. Ганцэцэг		✓	ажилтай	91578448	СХД 2 хороо 53-16	Ганцэцэг
11	Энхдалай	✓		ахлагч	80079588	СХД 2 хороо 44-11	[illegible]
12	Б. Уранчимэг		✓	Тэтгэвэрт	95770072	СХД 2 хороо 54-20	[illegible]
13	П. Болд	✓		Хувиараа	88200049, 88087323	СХД 2 хороо 52-7	[illegible]
14	Д. Равдан	✓		Хувиараа	80888343	СХД 2-р хороо 53-20	[illegible]
15	У. [illegible]		✓	х/ахлагч	96014610	СХД 2-р хороо 51-10	[illegible]
16	Д. Идэрсүрэн		✓	ЛБ-II	96053306	СХД-ийн 2 хороо	[illegible]
17	Ц. Отгонтуяа		✓	х/ахлагч	89985811	СХД-ын 2-р хороо 51-26	[illegible]
18	Э. Сүхболд	✓		Зурагчин	94001300	2-р хороо Өргөө 39-5	[illegible]
19	Б. Эрдэнэхүү	✓		жолооч	89955880	СХД II-р 50-5	[illegible]
20	Х. Асхан	✓		инженер	9401530	СХД II р 54-34	[illegible]
21	З. Балтдулмаа		✓	А-ийн	88008842	СХД 2-р 59-4	[illegible]
22	И. Цэцэгсүрэн		✓	х/ахлагч	98181296	СХД хороо 45-6	Цэцэгсүрэн
23	Д. Мөнхжаргал		✓	х/ахлагч	99747697	СХД 2р [illegible] 69 [illegible]	[illegible]
24	Д. Уранчимэг		✓	ажилгүй	88167624	2-р ор 38-4	[illegible]
25	Чанцлтөр		✓	Тэтгэвэрт	91220186	2-р 43-12	[illegible]
26	Оюун		✓	тэтгэвэрт	96556377	2-р 38-3	Оюун
27	Д. Дашдулмаа		✓	Т/Т	86137084	СХД 2-р 39-13	[illegible]
28	Д. Гэгээ	✓		Тэтгэвэрт	89611570	СХД 2-р хороо 49-5	[illegible]
29	Д. Даваа	✓		групп	88894590	СХД 2-р хороо 49-4	Даваа
30	Л. Далхаа	✓		тэтгэвэрт	99824554	СХД 2-р хороо 45-17	[illegible]
31	Ц. Хишгээ	✓		тэтгэвэрт	91568858	СХД II хороо 45-7	[illegible]

Оролцогчдын бүртгэлийн хуудасны маягт 2

Төслийн нэр Толгойт ... төв Дүүрэг Сонгинохайрхан Хороо 2р Огноо 2019.6.21

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	Х. Мубарактхан	✓		Тэтгэвэрт	98961214	Орбит -56-22	Х. Му
2	Л. Тунгалаг		✓	Тэтгэвэрт	88615567	Орбит 42-1	Тунгалаг
3	О. Дамдинсүрэн		✓	Тэтгэвэрт	99244541	Орбит 43-1	Дамдин
4	Д. Нарангэрэл		✓	тэтгэвэрт	86160902	Орбит 41-08	[illegible]
5	Д. Мөнхжаргал	✓		тэтгэвэрт	91352053	Орбит 57-1	[illegible]
6	Цэцэгсүрэн	✓		2 групп	99468497	Орбит 57-36	Цэцэгсүрэн
7	Н. Сүрэн		✓	хувиараа ХЭ	89048448	Орбит 59-10 тоот	Н. Сү
8	О. Шагдарсайхан		✓	2р хороо ...	99656281	Ор-55-24	Шагдар
9	М. Назарбаева	✓		тэтгэвэрт	91810136	Орбит 51-23	Наз
10	С. Довдонсүрэн		✓	тэтгэвэрт	95818700	Орб 38-5	С. Дов
11	Д. Баянсан		✓	тэтгэвэрт	88171941	Орбит 52-12	Баянсан
12	Ш. Патимхан		✓	тэтгэвэрт	95884194	Орбит 78-6	Патим
13	Г. Хишигт		✓	тэтгэвэрт	99922513	Орбит 59-27	Хишигт
14							

3d khoroo of Songinokhairkhan district

Оролцогчдын бүртгэлийн хуудасны маягт 1.

Төслийн нэр Тоноот дэд төв Дүүрэг Сонгинохайрхан Хороо 3р Огноо 2019.6.21

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Н. Батцэцэг		✓	тэтгэвэрт	99990059	[illegible] 11-17	[illegible]
2	Д. Нармандах		✓	гэрт	80172959	Бага наран 11-109	[illegible]
3	Ц. Оюунцэцэг		✓	тэтгэвэрт	88168499	[illegible]-2-4-12.	Оюу
4	В. Ганбодорж	✓		тэтгэвэрт	88911341	БН. 11.6.	[illegible]
5	Г. Мягмарсүрэн	✓		тэтгэвэрт	99637065	БН-4-3а	[illegible]
6	Б. Туяанаран		✓	Тэтгэвэрт	88408033	БН 28, 11	[illegible]
7	Х. Бадамцэцэг		✓		95673067	45-48-[illegible]	
8	М. Түрэл		✓	Тэтгэвэрт	88216761	БН-28-8	[illegible]
9						45-48	[illegible]
10	Х. Баярмагнай	✓		ажилгүй.			
11	Энхбат	+		групп	99673391	БН-11-14	[illegible]
12	Отгонбаяр	✓		тэтгэвэрт	96560473	БН-2-1-25	[illegible]
13	Б. Отгонжаргал		✓	групп	96060535	БН 13-35	[illegible]
14	Д. Цэцэгээ		✓	ажилгүй	88432686	БН 13-31 тоот	[illegible]
15	П. Наранцэцэг.		✓	тэтгэвэрт	99764898	БН-37-11	[illegible]
16	Р. Баасанжав		✓	тэтгэвэрт	96676468	БН35-14	[illegible]
17	Цолмон.		✓	гэрт	89722830	БН35-18б.	Цолмон
18	Д. Баатарсүрэн	✓		[illegible]	80508064	БН 3-2-6	[illegible]
19	Д. Чимэгбаатар		✓	тэтгэвэрт	95821009	БН 40-22	[illegible]
20	Б. Оюунсүрэн		✓	[illegible]	99190839	БН-7-4	[illegible]
21	Ц. Лхагваа		✓	тэтгэвэрт	91870326	БН-82-5	[illegible]
22	Д. Отгонцэцэг		✓	тэтгэвэр	88606006	БН 32-5	[illegible]
23	Г. Жаргалмаа		✓	гэрт	99152437	БН 43-47	[illegible]
24	Б. Баасанхүү	✓	~~✓~~	ГР	95829626	БН-43-48	[illegible]
25	М. Долгор		✓	тэтгэвэрт	95732153	БН-17-8	[illegible]
26	Д. Лхагва		✓	—	95870046	БН-[illegible]	[illegible]
27	Г. Наранцэцэг		✓	тэтгэвэрт	99677417	БН-25-11	[illegible]
28	М. Оюун		✓	тэтгэвэрт			
29					88405831	БН 29-2	
30	Е. Тунгалагцэцэг		Эм.	Гэрт	86774747	БН 241-11	[illegible]
31	Д. Магнай	✓		тэтгэвэрт	99841320	БН-38-24.	

Оролцогчдын бүртгэлийн хуудасны маягт 2

Төслийн нэр: [illegible] Дүүрэг: Сонгинохайрхан Хороо: 32 хороо Огноо: 2019-6-21

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	М. Сувдмаа		–	х/а	80145704	БН 18-49	М. Сувдмаа
2	М. [illegible]		–	тогооч	88774721	БН-27-09.	[illegible]
3	С. Сосорбурам		+	[illegible]	89235757	БН 9-11	Сосорбурам
4	И. Баасанхүү		+	х/ахлагч	88890352	БН 22-2а	[illegible]
5	Д. [illegible]		+	а/ахлагч	96969569	БН 19-18	[illegible]
6	М. [illegible]		+	х/ахлагч	96701257	БН 18-20	[illegible]
7	Х. [illegible]		+	х/ахлагч	88907376	БН-2-1-1	[illegible]
8	М. [illegible]		+	х/а.	89773366.	14-1А	[illegible]
9	Ц. [illegible]		+	а-ийн	95765642	БН 19-49	[illegible]
10	[illegible]		+	ажилгүй	94262891	БН-41-11	[illegible]
11	Ц. Цогтбаяр	+		[illegible]	99325162	БН 11-4	Цогтбаяр
12	[illegible]		+	декрет	96681186.	БН 32-1	[illegible]
13							
14							

22d khoroo of Songinokhairkhan district

Оролцогчдын бүртгэлийн хуудасны маягт 01.

Төслийн нэр Толгойт гэр төв Дүүрэг Сонгинохайрхан Хороо 22 Огноо 2019.6.20.

№	Нэрс	Хүйс Эр	Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Ю. Сүхээ	✓		тэтгэвэрт	88945200	Хилчин 47-53	[illegible]
2	Ж. Цэрэнлхамсүрэн		✓	тэтгэвэрт	99112282	Баянгол ам - 1 - 20	[illegible]
3	Л. Нарангэрэл		✓	хувиараа	99557698	Хилчин 18-15	[illegible]
4	Г. Шагдарсүрэн	✓		тэтгэвэрт	95286225	Хилчин 18-53	[illegible]
5	Т. Сэлэнгэ		✓	тэтгэвэрт	94492281	Хилчин 18-1	[illegible]
6	Д. Борхүү	✓		тэтгэвэрт	88240663	Х - 20 - 8	[illegible]
7	А. [illegible]	✓		[illegible]	89633330	Хилчин - 17 - [illegible]	[illegible]
8	Б. Оюунчимэг		✓	тэтгэвэрт	88999551	Хилчин 88-11	[illegible]
9	Л. Ганбаяр	✓		тэтгэвэрт	88897332	Хилчин 20-05	[illegible]
10	Ц. Зоригтбаатар	✓		тэтгэвэрт	95990780	Хилчин 49-6	[illegible]
11	Ж. Пүрэвдорж	✓		тэтгэвэрт	88554341	Х-16-01.	[illegible]
12	О. Монгол	✓		тэтгэвэрт	88167015	Хилчин 9-4.	[illegible]
13	С. Түвшинбаатар	✓		Хувиараа	96633076	Хилчин - 9 - [illegible]	[illegible]
14	Б. Заамбазундуй	✓			99871937	Хилчин 16-18	[illegible]
15	В. Чурхай	✓		Жолооч	99198008	Хилчин 35-16	Чурхай
16	З. Ганзориг	✓		Нийгмийн ажилтан	88110801	Хилчин 36-36	Ганзориг
17	Д. Хандсүрэн		✓	хувиараа	99195838	Хилчин 15-3	[illegible]
18	Д. Батзаяа	✓		ажилгүй	99614506	Хилчин 15-4	[illegible]
19	Т. Ариунаа	✓		Хувиараа	95286552	Хилчин 11-4	[illegible]
20	Б. Энхжаргал		✓	тэтгэвэрт	90767979	Хилчин 17-5	[illegible]
21	Э. ЭРДЭНЭТОГТОХ	✓		-	88268847	Хилчин 77-10	[illegible]
22	Н. Бүрэнжаргал		✓	хувиараа	88015568	Хилчин 45-30	[illegible]
23	Г. Үүрцайх-Эрдэнэ	✓		Үйлс Бизнес, [illegible]	88014379	Хилчин 13-4.	[illegible]
24	О. Цэрэндолгор		✓	Өрхийн эмч	[illegible]	Хилчин - 18 - 18	[illegible]
25	Д. Байгалмаа		✓	[illegible]	9916 [illegible]	Хилчин 18-25	[illegible]
26	С. Эрдэнэсүх	✓		хувиараа	99646197	Хилчин [illegible]-1	[illegible]
27	Ц. Ганзориг	✓		Автобусны жолооч	96565661	Хилчин 17.1	[illegible]
28	Д. Алтанцэцэг		✓	[illegible]	88376659	Хилчин 23-17	[illegible]
29	Энхдорждаа		✓	Тэтгэвэрт	88819100	Х-8-36-27	[illegible]
30	Алмаа	✓		тэтгэвэрт	88812215	Х-1-36-24	[illegible]
31	Бор.	✓		тэтгэвэрт	88240663	Х-20-8	Бор.

Оролцогчдын бүртгэлийн хуудасны маягт 2.

Төслийн нэр Төмөр зүг тов Дүүрэг Сонгинохайрхан Хороо 22 Огноо 2019.06.20.

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	Д. Гандуяа.	✓		тэтгэвэрт ✓	88297332	х-20-5	[illegible]
2	Б. Батбилэг		✓	хувийн ажилтан	93068138	х-46-30	[illegible]
3	Б. Ганхуяг.	✓		Байгаль хамгаалагч	80[illegible]	х-47-45	[illegible]
4	Б. Гантуяа.	✓		инженер механик	99163285	х-45-32.	Гантуяа.
5	Ч. [illegible]		✓	хувийн ажилтан	95580028	х-4-7.	[illegible]
6	Ц. [illegible] Баярмаа.		✓	[illegible] ✓	96029666	х-94-13	Баярмаа.
7	[illegible]		✓	хувийн ажил ✓	99011412	х-101-25	[illegible]
8	[illegible] Г. [illegible]		✓	тэтгэвэрт ✓	89631068	. 13-10	[illegible]
9	Д. [illegible]		✓	тэтгэвэрт ✓	[illegible]	[illegible] 40-5	[illegible]
10	О. [illegible]		✓	тэтгэвэрт ✓	80226648	[illegible] 11-13	[illegible]
11							

9th khoroo of Bayanzurkh district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр: Шар хад дэд төв Дүүрэг: Баянзүрх Хороо: 9 Огноо: 2019.6.22

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	[illegible]		+	[illegible]	99191057	[illegible]	[illegible]
2	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	+		[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]		+	[illegible]	98584690	[illegible]	[illegible]
6	[illegible]			[illegible]	[illegible]	БЗД 9 хороо	
7	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]		+	[illegible]	80510701	[illegible]	[illegible]
11	[illegible]	+		[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]		+	хувиараа	80530054	[illegible]	[illegible]
13	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]		+	[illegible]	88121529	[illegible]	[illegible]
15	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]		+	[illegible]	89505111	[illegible]	[illegible]
18	[illegible]		+		88601017	[illegible]	[illegible]
19	[illegible]		+	9-р хороо, ХЗХ	80020688	[illegible]	[illegible]
20	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]		+	9-р хороо [illegible]	99277759	[illegible]	[illegible]
22	[illegible]	+		9-р хороо [illegible]	95100990	[illegible]	[illegible]
23	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]		+	[illegible]	90693330	[illegible]	[illegible]
25	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	+		9-хороо хувиараа	88139833	[illegible]	[illegible]
29	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	+		[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]

9

Оролцогчдын бүртгэлийн хуудасны маягт 2

Төслийн нэр: Шар хад дэд төв Дүүрэг: Баянзүрх Хороо: 9-р Огноо: 2019-6-22

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	[illegible]		+	[illegible]	58.	88858553	[illegible]
2	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	+		[illegible]	99046575	[illegible]	[illegible]
4	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]		+	[illegible]	[illegible]	[illegible]	[illegible]
8							

17[th] khoroo of Bayanzurkh district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр: Шерхад дэд төв Дүүрэг: Баянзүрх Хороо: 17 Огноо: 2019.6.18.

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Т. Долгорсүрэн		✓	тэтгэвэрт	99048657	Ба. зүрх 653-15	[illegible]
2	У. Жанчив		✓	ансамбль	80144696	Ба/з - 18-609а	У Жанчив
3	Б. Оюунчимэг		✓	тэтгэвэрт	96986484	25 - 617	Б.Оюу
4	Т. Баянмөнх		✓	хувиараа	99542764	хороолол-18 594 тоот	[illegible]
5	Э. Болдбаатар	✓		тэтгэвэрт	91145440	Б/толгой - 29-765	[illegible]
6	Д. Энхээ. Төмөрбаатар	✓		тэтгэвэрт	89244677	зүүн 13-276	[illegible]
7	Т. Баясах		✓	СӨХ-д	99650581	61 - 80	[illegible]
8	Н. Отгонцэцэг		✓	тэтгэвэрт.	91534855	ахмадын 18 - 555	[illegible]
9	Д. Шинэцэцэг		✓	ажилгүй	80066085	хт 44-1014	Шинэ.
10	Энхбаяр		✓	хувиараа	86960027	з/т 43-1011	[illegible]
11	Х. Шинэзэвгэ		✓	НЭА	88986151	з/т 46-1046	Шинэзэвгэ
12	П. Ганцэцэг		✓	ажилгүй	86824279	з/т 45 1033	Ганцэцэг
13	М. Баянжаргал		✓	ажилгүй	95753798	зм 8-58	[illegible]
14	Т. Оюунчимэг		✓	ажилгүй	88908193	зм 1-6 тоот	[illegible]
15	Д. Пүрэв		✓	ажилгүй	88157590	зм 29-765а	[illegible]
16	С. Лхагва	✓		тэтгэвэрт	88089846	зм 18-504	[illegible]
17	Б. Наранбилэг		✓	—〃—	86559009	зм 4-289т	[illegible]
18	Ганцэцэг		С	[illegible]	99314250	ХТ-40-95	[illegible]
19	А. Алтанцэцэг		+	[illegible]	88199399	зм 13-247	[illegible]
20	Д. Ганхуяг		+		88869925	зт 29-365	[illegible]
21	Х. Туяа		✓	—х—	90625098	зм - 1-42	[illegible]
22	А. Баатар		✓	тэтгэвэр	88831724	зм 23-684	[illegible]
23	Х. Оюунбаатар		✓	тэтгэвэр	99781856	зм 14-428	[illegible]
24	Ариунзаяа		✓	—〃—	[illegible]	19 з.толгой 33-403	[illegible]
25	Мөнхтуяа		✓	—〃—	96018458	зт 32-930 тоот	[illegible]
26	У. Мягмар	✓		тэтгэвэрт	96212110	зм-6 - 335б	[illegible]
27	С. Эрдэнэчимэг		✓	хүүхэд	88718551	зм 7 - 357б	[illegible]
28	Ц. Батжаргал	✓		гадуур	88229560	ЗТ- 39-908	[illegible]
29	Б. Баттөмөр		✓	ХЭЗ	94490773	зм 13-242	[illegible]
30	Р. Ариунтуяа		✓	ажилгүй	99984789	зм 9 - 414 -	[illegible]
31	Д. Нямцэцэг		✓	ЖДҮ-СӨХ хувиараа	96063734	зм 13.580 тоот	[illegible]

Оролцогчдын бүртгэлийн хуудасны маягт 2

Төслийн нэр: Шар хад дэд төв Дүүрэг: Баянзүрх Хороо: 17 Огноо: 2019.6.18

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Ж. Оюунбилэг		эм	хувиараа	95034888	эм 8-384	Оюу
2	Д. Ариунбаяр		+	Багш	99640688	эм-4-283	Д. Ариу
3	Түвшинтогоо		+	өрх гэрийн	99919835	эм 13 176	[illegible]
4	Ц. Оюунчимэг		+	тэтгэвэрт	91960954	эм 4 83Г	Оюунчимэг
5	Ш. Өлзийсайхан		+	хувиараа	80920158	эм-15-446	[illegible]
6	Б. Мөнхзаяа		+	х/а	86896394	эм 2-13	[illegible]
7	Н. Оюунтунгалаг		+	х/а	99754148	эм 3-430	[illegible]
8	Баян		+	тэтгэвэр		ЛТ	[illegible]
9	Азжаргал		+	тэтгэвэр		ЛТ	[illegible]
10	Баясгалан		+	хувиараа	88104404	эм 17-492	[illegible]
11	Ц. Оюунцэцэг		+	тэтгэвэр	91189044	эм 9-146	Ц. Оюу
12	Э. Оюунгэрэл		+	ХА	80500340	эм 9-401	[illegible]
13	Н. Энхтуяа		+	Онцгойгоо	86893682	эм 2-294	[illegible]
14	М. Мөнхтүвшин		+	ХА	94006826	эм 18-560	Мөнхтүвшин
15	Р. Рина		+	тэтгэвэр	99333243	эм-7 348А	Рина
16	Б. Халтар		+	тэтгэвэр	88831724	эм 23-684	Халтар
17	Ц. Батцэцэг		+	ажилгүй	88626490	ҮТ 46-1040Г	Батцэцэг
18	С. Мөнхцэцэг		+	ажилгүй	99851781	ЭТ-34-900	[illegible]
19	Д. Жаргалсайхан	+	-	групп	86524752	эм-13-172	Жаргалсай
20	Д. Жаргал		+	групп	95403060	эм-13-172	Жаргал
21	У. Ариунцэцэг		+	Засаг дарга	91158882	Шар хад 65-4	[illegible]
22	Д. Мөнхзаяа		+	Засгийн Байгууллага	89094687	17/110-9971	[illegible]
23							

19th khoroo of Bayanzurkh district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр Шарсан gog mob Дүүрэг Баянзүрх Хороо 19 Огноо 2019. 6.22

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1	Н. Энхмарал		✓	энгийн ажилчин	89970169	БЗД 19 хороо 64а-102	[illegible]
2	Ч. [illegible]	✓		хувиараа	80262529	БЗД 19 х [illegible]	[illegible]
3	Б. [illegible]		✓	[illegible]	99007296	БЗД 19 хороо	[illegible]
4	С. Сандагдорж	✓		Хувиараа	94842896	БЗД - 19-р хороо	[illegible]
5	Л. Бүрэнтуяа		✓	ажилгүй	80405281	БЗД - 19-р хороо	[illegible]
6	Б. Пүрэвсүрэн		✓	ажилгүй	88789272	БЗД - 19 хороо	[illegible]
7	Б. Батбаяр		✓	хувиараа	95213950	БЗД - 19-р хороо	[illegible]
8	Л. Алтанзул		✓	ажилгүй	89976676	19-р хороо	[illegible]
9	М. Ариунжаргал		✓	хувиараа	88081304	19-р хороо	[illegible]
10	Д. Бэгз.	✓		[illegible]	898552[illegible]	19р хороо	[illegible]
11	Ц. Батцэцэг.		✓	хувиараа	80082478	19-р хороо	[illegible]
12	[illegible]		✓	[illegible]	88911323	19-р хороо	[illegible]
13	Х. [illegible]		✓	Хувиараа.	88989942	19 хороо	[illegible]
14	[illegible]	✓		хувиараа	96009412	19 хороо	[illegible]
15	Бат-Тогс	✓		Хувь	80070995	19-р Хороо	[illegible]
16	Д. Лхагвасүрэн		✓	г.н.	88580425	19 х	[illegible]
17							

22d khoroo of Bayanzurkh district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр Шарлаг [illegible] Дүүрэг Баянзүрх Хороо 22р Огноо 2019.6.22

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Н. Тогтох		эм	ажилгүй	99995058	БЗД-22р хороо 3АО-8-160	[signature]
2	[illegible]		эм	ажилтай	88158414	Д 15-207	[signature]
3	Д. Цэцэгээ		эм	[illegible]	88689934	21-15-212	[signature]
4	Э. Амина		✓	Хоолны газар	88049302	[illegible] 15-232	[signature]
5	Б. Мөнхзул		+	Ажилтай	88679346	Алтай 10-141	[signature]
6	Д. Алтанцэцэг		+	Ажилтай	89696017	АО-7-76	[signature]
7	Ж. Батхишиг		+	Ажилтай	88952636	БАО-29-463	[signature]
8	Б. Зугэрдэнэ	+		Ажилгүй	89800292	ЗАО-10-147	[signature]
9	Б. Цогзолмаа		+	+	86032166	ЗАО-14-347	[signature]
10	Д. Нямсүрэн		+	ажилтай	80111178	АО 5-51	[signature]
11	Я. Батмөнх		+	тэтгэвэрт		АО 12б-1592	
12	О. Одгэрэл		+	нөхөн сэргээх	88724417	БАО-23-346	[signature]
13	Д. Оюунцэцэг		+	ТАХ (хорооны ...)	99855803	АО 5-5/а	[signature]
14	[illegible]	+			86110464	АО 7 76	[signature]
15	Б. Заяа		+	ажилтай	89764600	БАО 36-623	[signature]
16	Х. Бат-Өлзий	+		—	88334679	Б.З.Д.3.АО.10.к204а	[signature]
17	[illegible]		+	Ажилтай	86115464	-7-41 тоот	[signature]
18	С. Нямаа		+	[illegible]	88486098	7-95 Атоот	[signature]
19	О. Гандэгэг		+	ажилгүй	88918812	БАО.29-487	[signature]
20	Г. Насанжаргал		+	22-р ажилтан	98227831	АО-14-180	[signature]
21	Ч. Арсланбаатар	+		СС х3Б			
22	Б. Мандухай		+	22 р. ажилтан	86765158	АО-15-191	[signature]
23	Б. Мандухай		+	[illegible]	88184018	3АО-22к 102 тоот	[signature]
24	С. Нарантуяа		+	5/ [illegible]	95250585	БЗД 1 р.хороо 14 хороолол	[signature]
25	У. [illegible]		✓	тэтгэвэрт			
26	[illegible]		✓	тэтгэвэрт			
27							
28							
29							
30							
31							

24th khoroo of Bayanzurkh district

Оролцогчдын бүртгэлийн хуудасны маягт 1

Төслийн нэр Шархад дээд тов Дүүрэг Баянзүрх Хороо 24 Огноо 2019.06.18.

№	Нэрс	Хүйс Эр	Хүйс Эм	Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
1	Т. Наранбаатар	V		хувийн хоол бэлтгэгч	9962 1067	Хорьоолол 11-12	[illegible]
2	Б. Отгонбаяр		V	гэрийн эзэн	95636344	Цахлай 12-36б	[illegible]
3	Б. Даваадулам		V	гэр ахуй мастер	99976553	Цахлай 12-99а	Даваадулам
4	[illegible]. Лхагвасүрэн		V	гэрийн [illegible]	89954251	цахлай 11-17	Лхагвасүрэн
5	Ц. [illegible]		V	[illegible]	96632571	газарчин 5-19	[illegible]
6	Оюунцэцэг		V	[illegible]	89129922	Хорьоолол 4-1	[illegible]
7	Х. [illegible]		V	Гэрийн эзэн	93775468	Хорьоолол 1/3	[illegible]
8	Ч. [illegible]		V	[illegible]	88737783	[illegible] 6-26	[illegible]
9	Б. [illegible] (У		V	[illegible]	99887980	[illegible] 1-34	[illegible]
10	Б Ундрах		V	Гэрт	95108188	[illegible] 1-34	[illegible]
11	П. Бямбасүрэн		V	Гэртээ	84829972	Хорьоолол 4-1	Бямбасүрэн
12	Ч. [illegible]	V		[illegible]	88115330	[illegible] 1-87 тоот	[illegible]
13	Э. [illegible]	V		Цэргийн [illegible]	95114795	[illegible] 1-2	[illegible]
14	Б. Оюунцэцэг		V	тэтгэвэрт	9915-858	Овоот - 3-7 тоот	[illegible]
15	Л. Батсүх	V		Тэтгэвэрт	95196122.	Газарчин-7-12 тоот	[illegible]
16	[illegible]	V		Тэтгэвэрт	88654541	Овоот 4-ийн 12.	[illegible]
17	Г. Алтанцэцэг		V	оюутан	94126252	овоот 4-11	[illegible]
18	[illegible]		V	[illegible]	99257039	ов 4-11	[illegible]
19	[illegible]	V		Тэтгэвэрт	96665840	[illegible] 4-4	[illegible]
20	Э. [illegible]		V	Гэрт	96692511	овоот 5-32	[illegible]
21	Д. [illegible]		V	Гэрт	88606602	овоот 5-34	[illegible]
22	Н. [illegible]		V	Гэрт	88809209	овоот 7-24	[illegible]
23	Б. [illegible]		V	[illegible]	95113635	овоот 1-2	[illegible]
24	[illegible] Баясгалан		V	/т эм [illegible]	88482683	овоот 7-20 тоот	[illegible]
25	Г. Сарангуа		V	Эх	80802009	цахлай 13-41	Сарангуа
26	Т. [illegible]	V			86995?77	[illegible] 6-39	[illegible]
27	Б. [illegible]	V		тэтгэвэрт	95331587	[illegible] 5-9	[illegible]
28	И. [illegible]	V		хувиараа	94442125	Хорьоолол 4-5 тоот	[illegible]
29	Б. [illegible]	V		Зах	99862351	Цахлай 16-198	[illegible]
30	Н. [illegible]		V	гэрт	91209113	овоот - 1-24 тоот	[illegible]
31	Д. [illegible]		V	хувиараа	88947790	Овоот 2-9	[illegible]

Оролцогчдын бүртгэлийн хуудасны маягт 2.

Төслийн нэр Шарга дэд зов Дүүрэг Баянзүрх Хороо 24. Огноо 2019.6.18

№	Нэрс	Хүйс		Эрхэлдэг ажил	Утас	Харьяалал/хаяг/	Гарын үсэг
		Эр	Эм				
1			✓				
2			✓				
3			✓				
4		✓					
5		✓					
6			✓				
7			✓				
8			✓				
9			✓				
10			✓				
11		✓					
12			✓				
13			✓				
14			✓				
15			✓				
16			✓				
17			✓				
18			✓				
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24			✓				
25			✓				
26		✓					
27			✓				
28		✓					
29		✓					
30							