Initial Environmental Examination

June 2018

MON: Regional Road Development and Maintenance Project

Prepared by the Ministry of Roads Transport and Development for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 23 May 2018)

Currency Unit	=	Mongolian tugrik
MNT 1.00	=	$0.39457071
$1.00	=	MNT 2,400

ABBREVIATIONS

AP	-	Affected People
ADB	-	Asian Development Bank
CAREC	-	Central Asia Regional Economic Cooperation
DEIA	-	Detailed Environmental Impact Assessment
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EA	-	Executing Agency
GEIA	-	General EIA
GHG	-	Greenhouse Gas
GRM	-	Grievance Redress Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IUCN	-	International Union for Conservation of Nature
MET	-	Ministry of Environment and Tourism
MOF	-	Ministry of Finance
MRTD	-	Ministry of Road Transport Development
MRTD	-	Ministry of Roads Transport and Development
MNT	-	Mongolian Tugrik
PIU-EMS	-	PIU-Environmental Monitoring Specialist (consultant)
PIU	-	Project Implementation Unit
PMC	-	Project Management Consultant
PSC	-	Project Steering Committee
PPTA	-	Protect Preparatory Technical Assistance
PCU	-	Public Complaints Unit
RAM	-	Road Asset Maintenance
SPS	-	Safeguard Policy Statement
SPA	-	Specially Protected Areas
STA	-	Station (chainage)
SEA	-	Strategic Environmental Assessment
TA	-	Technical Assistance
UNFCC	-	UN Framework Convention on Climate Change
UNEP	-	United Nations Environment Programme
WHO	-	World Health Organisation

WEIGHTS AND MEASURES

^{o}C	–	Degree Celsius
km	–	Kilometer
m	–	Meter
dB	–	Decibel
L_{Aeq}		Equivalent Continuous Level 'A weighting' - 'A'-weighting = correction by factors that weight sound to correlate with the sensitivity of the human ear to sounds at different frequencies
km^2	–	Square kilometer
$\mu g/m^3$	–	Microgram per cubic meter

GLOSSARY

aimag	–	Provincial country division
soum	–	Sub-district division
Bag or bagh	–	Third level administrative subdivision e.g. sub-district

NOTE

(i) In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

A. The Project

1. The project aims to contribute to the enhanced local, regional, and international connectivity in Mongolia by improving efficiency of road transport within the project area and between countries improved. The project consists of three output: (i) Output 1: Road asset management capacity improved. enhance capacities and improve investment on road maintenance in Mongolia. The project outputs are (i) road asset management capacity improved; (ii) road condition improved at an important regional road section that links the Russian Federation and Mongolia's capital and comprises part of CAREC road corridor 4b; (iii) road safety improved.

2. The project on road maintenance is classified as environmental category "B", requiring an Initial Environmental Examination (IEE). This IEE report is prepared in accordance with ADB's Safeguard Policy Statement (SPS) 2009.

B. Key Findings

3. This current IEE is prepared for output 2 of the project, which is limited to road maintenance and rehabilitation works on the existing paved road sections that are in poor conditions due to lack of routine road maintenance works. The road sections under the project is the only transport corridors in the project areas where no other transport alternatives like railways or aviation options exist. This IEE focuses on output 2 of the project.

4. The environmental baseline study confirms that humans are the most sensitive receptors in the project corridors. This includes people who are living permanently in the residential areas through which the roads pass, and the nomadic herders who pass through.

5. The project area of influence does not contain any nationally protected areas however the Darkhan-Altanbulag corridor passes through a locally protected the Tujiin Nars forest which has protection status of "natural reserve". There are five noted areas where the forest is encroaching onto the right of way and for safety reasons, tree removal will be required. The environmental department of the Selenge province and Sukhbaatar soum administration are responsible for the pine forest and permission for removal of trees will be sought.

6. There are a number of rivers crossed by the project road in three locations; the Shariin Gol, Yeruu, and Orkhon rivers are crossed north of Darkhan and also 20 km from Darkhan city the road passes within 100 m of Shariin Tsagaan lake.

7. The vegetation dominating either side of both project corridors is grassland, which is used for pasture land by herders in the areas. The percentage of herder households along both corridors varies from 19 to 70% and all *soums* in the corridors have considerable heads of livestock registered in them.

8. The principal impacts during the design phase are associated with the planned relocation of trees, particularly from the pine forest area along the Darkhan-Altanbulag corridor, where trees encroach into the right of way and reduce traffic safety. During the construction phase, there will be impacts in both corridors are associated with the noise and dust consistent with construction projects of this type, and the associated health and safety risks for contractors undertaking the work. In addition, for both corridors, there is a potential impact on the grassland used for pasture

along both sides of the project corridors, when haul routes or deviations are required by the contractor and deviations also gives rise to the risk of impact on the above ground infrastructure of groundwater wells. No impacts on the water quality of the wells are anticipated.

9. No impacts are anticipated during operation as the road is already operational. Instead, the traffic safety works associated with this project outputs are anticipated to bring benefits to the communities along the project corridor and all other road users.

C. Environmental Management Plan

10. An Environmental Management Plan (EMP) is established in this IEE report. The EMP aims to avoid impacts where possible and mitigate those impacts which cannot be eliminated to an acceptable and minimum level.

11. The mitigation measures set out in the EMP for the project will manage the impacts during pre-construction and construction. The mitigation measures implemented in the pre-construction phase will promote the elimination of impacts associated with the surface water, groundwater and cultural heritage receptors in the project area through breaking the source-pathway-receptor links and removing the impact pathway. For the remaining impacts which cannot be avoided, the mitigation measures seek to minimize them to acceptable levels. The key mitigation measures will include:

(i) Demarcating receptors to ensure the contractor will avoid contact with them. This includes establishing water protection zones around surface water river crossings, at a lake adjacent to the road, around groundwater wells and at a site of cultural heritage;
(ii) Ensuring the contractor submits and follows a comprehensive Health and Safety Management Plan to protect the health of the workers throughout construction;
(iii) Ensuring the contractor submits and follows a comprehensive waste management plan to protect the environment and health and safety from inappropriate waste disposal;
(iv) Compensation planting for trees removed from within the right of way, in accordance with Mongolian Forest Law and appropriate measures to ensure the aftercare of saplings;
(v) Rehabilitation of any pasture land which may be affected through the use of haul routes or deviations; and
(vi) Taking practical measures to minimize the nuisance caused by noise and dust.

12. In addition, a robust programme of monitoring is established by the EMP and regular reporting will be required and will include monitoring activities as required by the Environmental Impact Assessment required under Mongolian law. Through monitoring and reporting any deviation from the EMP or unanticipated impacts can be dealt with by PIU staff. Also the Grievance Redress Mechanism will be in place and managed by the PIU in order to appropriately handle any complaints arising from project activities.

D. Conclusion

13. This IEE concludes that in both project road corridors, the impacts associated with the road rehabilitation can be eliminated through design or mitigated to acceptable levels. The negative impacts will be short term and the positive impacts will be long term improvements in safety throughout the project road corridors.

I. INTRODUCTION

A. Project Rationale

1. **Strategic context.** Since 1991, the Asian Development Bank (ADB) has been a major partner in the improvement of Mongolia's transport network and has assisted in developing two major highway corridors linking Mongolia to the Russian Federation and the People's Republic of China (PRC).[1] This has brought development, jobs, and social services to those regions; and improved the lives of the poor.

2. Mongolia's economy has grown rapidly, with gross domestic product increasing more than 720% from $1.27 billion in 2001 to $10.41 billion in 2011. However, gross domestic product growth fell from 17.3% in 2011 to 5.1% in 2017 because of plummeting foreign direct investment, falling commodity prices, and moderating growth in the PRC. Mongolia urgently needs to restore macroeconomic stability in the short term and to develop a more resilient and diversified economy that can deliver rapid, inclusive, and sustainable growth in the long term. This requires infrastructure investments and regional integration to improve connectivity and access to domestic and external markets.[2]

3. Mongolia's poverty rate is high for a lower middle-income economy.[3] Much of the poverty stems from unemployment, the absence of local markets, and lack of education. The poor condition of roads aggravates persistent poverty conditions, particularly in rural areas. The rural population has limited access to social services and major markets in the region and *aimags*.[4] Travel is costly and uncomfortable. Without access to markets, local farmers and herders are forced to sell their products at lower prices.

4. Investing in road improvement is particularly important at times of economic difficulty as it delivers four benefits: (i) projects create much-needed jobs to support economic recovery; (ii) better roads reduce road user travel costs and facilitate access to markets, schools, and health facilities, making residents more productive; (iii) modest spending on road maintenance prevents costlier rehabilitation; and (iv) road safety improvements reduce the social cost of traffic accidents.

5. **Sector performance**. The construction, maintenance, and rehabilitation of state roads are funded by the state budget, development banks, and international loans and grants. During 2011–2015, MNT1.88 trillion was invested in the upgrade and construction of roads and bridges.

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[1] ADB. 1995. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Technical Assistance Grant to Mongolia for the Roads Development Project*. Manila; ADB. 1999. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Technical Assistance Grant to Mongolia for the Second Roads Development Project*. Manila; ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Supplementary Loan and Grant to Mongolia for the Regional Road Development Project*. Manila; and ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility to Mongolia for the Western Regional Road Corridor Investment Program*. Manila.

[2] ADB. 2017. *Country Partnership Strategy: Mongolia, 2017–2020—Sustaining Inclusive Growth in a Period of Economic Difficulty*. Manila.

[3] Middle-income economies have per capita gross national income (GNI) of $1,006–$12,235 and lower middle-income economies have per capita GNI of $1,006–$3,955. Mongolia's poverty rate at $1.90 threshold was 0.22 in 2014, and the per capita GNI was $3,590 in 2016.

[4] Provincial administrative unit in Mongolia.

These expenditures were regulated by the Mongolian Road Law, 1998 and funded by the State Road Fund.[5] However, insufficient funds were collected as taxes were often reduced or canceled to keep fuel prices under control amid fuel price increases in the Russian Federation, on which Mongolia depends for much of its fuel.

6. While investment in new road construction has grown, it has not been matched by commensurate increases in road maintenance and rehabilitation. The state budget provides separate annual allocations for routine maintenance and rehabilitation, but the government has not funded any major maintenance or rehabilitation projects in 2011–2015, and the amount allocated to the Ministry of Road and Transport Development (MRTD) for routine maintenance has been constrained to only 15% of estimated needs. Consequently, road maintenance has been insufficient, and the condition of the existing road network has deteriorated, making transport costs expensive and Mongolia's exports uncompetitive.

7. The country urgently needs to improve its road asset maintenance (RAM). A previously implemented RAM system is no longer used because of limited funding. Timely road maintenance is less costly than allowing roads to deteriorate and need major rehabilitation or reconstruction—saving money in tight fiscal situations. This requires capacity development and institutional strengthening, significant investment in a periodic maintenance and rehabilitation program, and stronger enforcement of vehicle weight restrictions to prevent costly road damage from overloading.

8. **Asset management**. To improve accessibility and optimize government spending, ADB has conducted extended dialogue with the government since 2009 through TA to prepare and implement a sector road map and capacity development strategy, including the provision of a RAM system.[6] TA activities helped the government prioritize work for a periodic maintenance and rehabilitation program. Major lessons from this work included the need for predictable funding and systematic asset management practices.

9. Partly as an outcome of ADB policy dialogue, the government passed the Mongolian Road Law Amendment, 2017, which ensures that at least 20% of revenues from the vehicle excise tax are allocated to road maintenance. This would add about MNT7 billion to the road fund each year.[7] Significantly higher fines and penalties, including for truck overloading, will also go into the road fund. Unlike in the past, the fund is only for road maintenance and not for new road construction. The amendment is an important policy change that the project will support.

10. **Road safety**. Lack of road maintenance amid rapidly increasing passenger car ownership has an immediate impact on road safety and the social cost of traffic fatalities and injuries.

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[5] The road fund was established through a 1991 government decree to help stabilize the funding available to the road sector. In 1998, the Road Law distinguished between the state road fund and local road funds. Further information on fund revenue and spending is provided in Sector Assessment (Summary): Transport; and Financial Analysis (accessible from the list of linked documents in Appendix 2).

[6] ADB. 2009. *Technical Assistance to Mongolia for Road Database Development Using Geographic Information System*. Manila; and ADB. Mongolia: Preparation of a National Road Sector Capacity Development Roadmap. https://www.adb.org/projects/44303-012/main (the Government of Mongolia approved the road map on 24 August 2011); and ADB. 2011. *Technical Assistance to Mongolia for Road Sector Capacity Development*. Manila ($2 million financed on a grant basis by the Japan Fund for Poverty Reduction).

[7] The State Great Hural (Parliament) of Mongolia. http://www.parliament.mn/n/xroy. The law also provides for an increase in vehicle excise tax rates by 5% to 15%, depending on engine size and vehicle age.

Mongolia has a relatively high road traffic death rate of 22 per 100,000 population.[8] Under the Central Asia Regional Economic Cooperation (CAREC) program, ADB has supported the development of a road safety strategy that aims to reduce fatalities on CAREC road corridors by 50% by 2030, against 2010 levels.[9] ADB also assists the government in developing a national road safety policy and action plan covering three road safety elements: (i) culture and behavior; (ii) engineering, both in design and maintenance, including winter activities such as snow control and deicing; and (iii) education, including traffic safety awareness, driving skills, and traffic rules.[10] The project will help Mongolia implement the action plan by adopting international best practices.

B. Project Impacts, Outcomes, and Outputs

14. The project is aligned with the following impact: inclusive economic growth promoted by enhanced local, regional, and international connectivity in Mongolia. The project outcome will be efficiency of road transport within the project area and between countries improved.

15. **Output 1: Road asset management capacity improved.** This output will strengthen sustainable road maintenance practices and build capacity for the implementation of maintenance projects prepared and procured during the project. Capacity-building activities will include (i) reestablishing and providing training on the RAM system to improve maintenance planning, implementation, and prioritization;[11] (ii) designing improvements in road funding to ensure the sustainability of maintenance activities, including measures to prevent vehicle overloading; and (iii) supporting pilot performance-based maintenance. The contract payment method will be linked to performance evaluation. Thus, it aims to enhance maintennance performance of potential contractors both in terms of maintenance work quality as well as its environmental management performance. This output will be delivered partly through attached TA and partly with output 2.

16. **Output 2: Road condition improved.** This output will preserve and improve important regional road sections that link the PRC and the Russian Federation through Mongolia's capital and comprises part of CAREC road corridor 4b. The project will improve 311 kilometers (km) of existing national highway sections comprising Ulaanbaatar–Darkhan (193 km) and Darkhan–Altanbulag (118 km). Improvement works will include (i) pavement treatment and (ii) widening of carriageways, including climbing lanes and shoulders within the existing right-of-way (ROW).

17. **Output 3: Road safety improved**. This output will provide capacity development in road safety policies and the implementation of safety features in the road condition improvement works undertaken with output 2. Safety features will include improvements in road markings, barriers, and guide posts. Climbing lanes will be constructed within the ROW at traffic accident blackspots, where overtaking of slow-moving vehicles often causes fatal head-on collisions. Independent road safety audits will be conducted on detailed designs, as well as a post-construction audit.

18. The project is classified as environmental category "B", requiring an Initial Environmental Examination (IEE). This IEE report is prepared in accordance with ADB's Safeguard Policy

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[8] World Health Organization. 2015. *Global Status Report on Road Safety, 2015*. Geneva.
[9] ADB. 2017. *Safely Connected: A Regional Road Safety Strategy for CAREC Countries, 2017–2030*. Manila.
[10] ADB. 2016. *Technical Assistance to Mongolia for the Development of a Road Safety Policy and Action Plan*. Manila.
[11] A team of experts under the attached TA will assess the use of equipment and planning tools provided in 2010 under ADB. 2009. *Technical Assistance to Mongolia for Road Database Development Using Geographic Information System*. Manila.

Statement (SPS) 2009.

Figure 1: Project Location

C. Structure of This Report

19. This IEE report is structured as follows:

I. Executive Summary outlines important facts, major findings, and recommended actions of the IEE.
II. Policy, Legal, and Administrative Framework - presents the national and local legal and institutional framework within which the environmental assessment is carried out. It describes the environmental categorization by ADB and Ministry of Environment and Tourism (MET) based on an environmental screening.
III. Description of the Project - provides a justification of the project based on a sector analysis; a detailed description of the project, including project location and components.
IV. Description of the Environment (Baseline Data) - physical, biological, and socioeconomic conditions within the project area. ADB's SPS 2009 requires environmental assessments to address induced impacts and risks to (i) physical (ii) biological (iii) socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues) (iv) physical cultural resources in the context of the project's area of influence; and (v) potential transboundary and global impacts, including climate change.
V. Anticipated Environmental Impacts and Mitigation Measures - predicts and assesses the project's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the project's area of influence; identifies mitigation measures and any residual negative impacts that cannot be mitigated.
VI. Information Disclosure, Consultation, and Participation - the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders and addressing the comments raised in consultation.
VII. Grievance Redress Mechanism (GRM) – presents the GRM established to handle grievances and complaints arising during project implementation. It defines GRM entry points, timeframe and institutional responsibilities of the GRM.
VIII. Environmental Management Plan (EMP) – the EMP defines the mitigation measures, performance indicators, environmental monitoring requirements, institutional responsibilities, training activities related to environmental management, reporting requirements, and a mechanism for feedback and adjustment.
IX. Conclusion and Recommendation. Summarizes the major environmental impacts and mitigation measures, defines project risks and required project assurances, and concludes on the environmental soundness of the project.
X. Appendices.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Mongolia's Environmental Policy

20. 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 areas such as national parks, 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 the Constitution, international treaties and environment and resource protection laws[12].

21. The main policy documents are the National Biodiversity Program 2015-2025, the State Environmental Policy of 1997, the National Plan of Action to Combat Desertification, and the National Plan of Action for Protected Areas, all developed under the Ministry of Environment and Tourism (MET) auspices, and a set of environmental laws that were amended in May 2012. In addition, other guidance documents with important environmental repercussions were developed under the auspices of other ministries and these include the Roads Master Plan, the Power Sector Master Plan, the Tourism Master Plan, and the Renewable Energy Master Plan. Other documents, such as the annual Human Development Reports have increasingly incorporated environmental aspects.

22. A fundamental principle of the Mongolian state environmental policy is that economic development must be in harmony with the extraction and utilization of natural resources and that air, water and soil pollution will be controlled. In April 1996, Mongolia's National Council for Sustainable Development was established to manage and organize activities related to sustainable development in the country. The country's strategy is designed for environmentally friendly, economically stable and socially wealthy development, which emphasizes people as the determining factor for long-term sustainable development.

23. The health of Mongolia's natural ecosystems and populations of wild species is of both national and global importance. The country forms an important part of the global ecosystem where the ecoregions of the Siberian taiga, the Eurasian steppe, the high Altai Sayan, and the Gobi Desert converge. In recognition of its global responsibilities, Mongolia has acceded to a number of international environmental conventions which places obligations on signatory governments. The key conventions are in Table 1.

Table 1: International Environmental Conventions Signed by Mongolia

Convention	Year of Accession
Convention on Biological Diversity	1993
UN Framework Convention on Climate Change (UNFCCC)	1994
Kyoto Protocol	1999
UN Convention on Combating Desertification	1996
Convention on the Protection of Wetlands of International Importance (Ramsar)	1998
Vienna Convention for the Protection of the Ozone Layer	1996
Montreal Protocol (regulating substances that deplete the ozone layer)	1996
Convention on International Trade in Endangered Species of Fauna and Flora (CITES)	1996

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

Convention	Year of Accession
Convention on the Transboundary Movement of Hazardous Waste (Basel)	1997
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	2000
Stockholm Convention on Persistent Organic Pollutants	2004
World Heritage Convention	1990
Convention on the Conservation of Migratory Species of Wild Animals	1999

24. The Government of Mongolia undertook a major environmental law reform in 1990 including the law of land, protected areas, water, forest, wildlife, and native flora resources. A further reform was undertaken in 2012, shown in Table 2.

Table 2: National Environmental Laws

Name of the Law	Amended names of the laws	Year Adopted	Years of amendment
The Constitution of Mongolia		1992	
Law on Environmental Protection		1995,	2006 and 2008
Law of Land		2002	
Law on Land Cadastre and Mapping		1999	
Law on Land Fees		1997	
Law on Land Possession		2002	
Law on Special Protected Areas		1994	
Law on Buffer Zones		1997	
Law on Water		2004	2012
Law on Water and Mineral Water Resource Fee	Law on Natural Resource Fee	1995	2013
Law on Forests	Law on Forest	1995	2012
Law on Prevention of Steppe and Forest Fires	Law on Forest	1996	2012
Law on Reinvestment of Natural Resource Use Fees for Conservation	Law on Natural Resource Fee	2000	2012
Law on Natural Plants		1995	
Law on Protection of Plants		1996	
Law on Fauna		2000	2012
Law on regulation of export and import of endangered species (flora, fauna)		2002	
Law on Underground Resources		1994	
Law on Mineral Resources		1997, 2006	
Law on Petroleum		1991	2014
Law on Air		1995	2012
Law on Hydrometeorology		1997	
Law on Protection from Toxic Chemicals		1995	2006
Law on Environmental Impact Assessment		1998, 2002	2012

Name of the Law	Amended names of the laws	Year Adopted	Years of amendment
Law on Tourism		1998	2000
Law on Solid Waste	Law on Waste	2003	2012
Law on prohibiting export and transportation of Hazardous Waste	Law on Waste	2000	2012

B. Environmental Assessment Requirements

25. The project is subject to the environmental requirements of both Mongolia and ADB. These requirements are defined in the next two sections.

1. Environmental Assessment Requirements of ADB

26. Safeguard requirements for all projects funded by ADB are defined in ADB SPS 2009. SPS 2009 establishes an environmental review process to ensure that projects undertaken as part of programs funded through ADB loans are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. SPS 2009 is underpinned by the ADB Operations Manual, Bank Policy (OM F1, 2010). The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines[13]. This IEE is intended to meet SPS 2009 requirements.

27. SPS 2009 environmental assessment requirements specify that:

(i) At an early stage of project preparation, the borrower/client will identify potential direct, indirect, cumulative and induced environmental impacts on and risks to physical, biological, socioeconomic, and cultural resources and determine their significance and scope, in consultation with stakeholders, including affected people and concerned non-government organizations. If potentially adverse environmental impacts and risks are identified, the borrower/client will undertake an environmental assessment as early as possible in the project cycle. For projects with potentially significant adverse impacts that are diverse, irreversible, or unprecedented, the borrower/client will examine alternatives to the project's location, design, technology, and components that would avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks;
(ii) The assessment process will be based on current information, including an accurate project description, and appropriate environmental and social baseline data;
(i) Impacts and risks will be analyzed in the context of the project's area of influence;
(i) Environmental impacts and risks will be analyzed for all relevant stages of the project cycle, including preconstruction, construction, operations, decommissioning, and post-closure activities such as rehabilitation or restoration;
(ii) The assessment will identify potential trans-boundary effects as well as global impacts; and

[13] New Version of the *"World Bank Group Environmental, Health, and Safety Guidelines"*, April 30, 2007, Washington, USA.http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

(iii) Depending on the significance of project impacts and risks, the assessment may comprise a full-scale environmental impact assessment (EIA) for category A projects, an IEE or equivalent process for category B projects, or a desk review.

28. Other requirements of SPS 2009 include:

(i) Alternatives Analysis. There is a requirement to examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and consider the no project alternative. SPS 2009 states that this is only for projects which have ''significant adverse environmental impacts that are irreversible, diverse, or unprecedented'' i.e. Category A projects. This does not apply to this Category B IEE therefore is not included in this IEE.
(ii) Environmental Management Plan. The borrower/client will prepare an EMP that addresses the potential impacts and risks identified by the environmental assessment.
(iii) Consultation and Participation. The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.
(iv) Information disclosure. The borrower/client will submit to ADB the following documents for disclosure on ADB's website: (i) a draft full EIA (including the draft EMP) at least 120 days prior to ADB Board consideration; (ii) the final EIA; (iii) a new or updated EIA and corrective action plan prepared during project implementation, if any; and (iv) semi-annual environmental monitoring reports.
(v) Grievance Redress Mechanism. The borrower/client will establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the project's environmental performance.
(vi) Monitoring. The borrower/client will monitor and measure the progress of implementation of the EMP.

2. Environmental Assessment Requirements of Mongolia

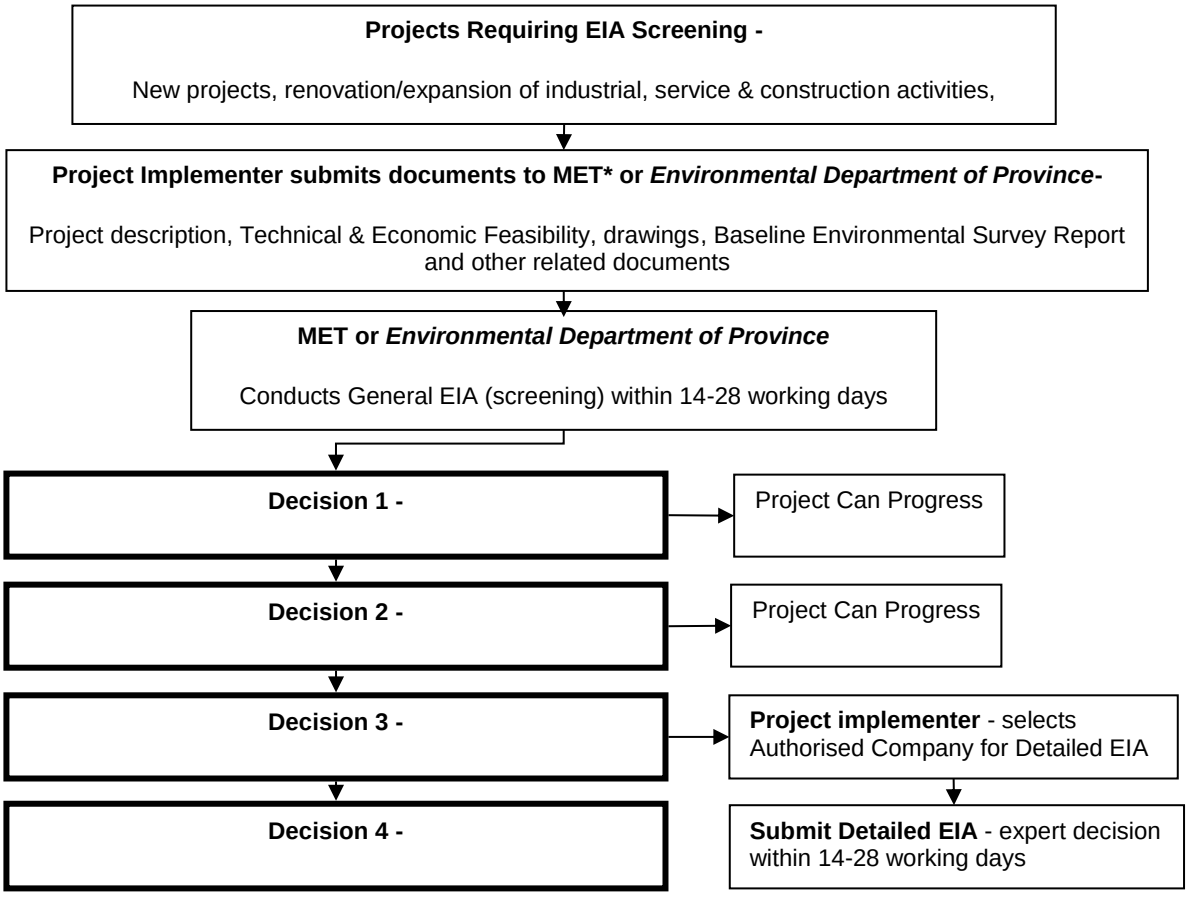
29. The EIA requirements of Mongolia are regulated by the Law on EIA (1998, amended 2002[14] and amended 2012). The terms of the law apply to all new projects, as well as rehabilitation and expansion of existing industrial, service or construction activities and projects that use natural resources.

30. The most recent amendment to the law was adopted in May 2012 and was brought into force in January 2014, implemented through a new Environmental Impact Assessment Regulation[15]. The 2012 amendment introduces a requirement for Strategic Environmental Assessment for policy documents and increases emphasis on public participation during a general EIA.

[14] Law of Mongolia on Environmental Impact Assessments (1998, amended in 2002). Unofficial translation available from http://cdm-mongolia.com.
[15] 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.

31. 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 2.

Figure 2: EIA Process in Mongolia



*Ministry of Environment and Tourism
Source: Adapted from Vol. 1 (2001) Compendium of Laws: A Mongolian Citizens Reference Book

32. The type and size of the planned activity define responsibility as either MET or aimag (provincial) government. There are two types of EIAs defined in Law:

(i) **General EIA (GEIA - screening)** - to initiate a General EIA, the project implementer submits to MET (or Environmental department of corresponding province) the following: Finalized Project Design or an approved Feasibility Study, Baseline Environmental Survey Report, a letter of *soum* governor which requests General EIA, technical details, drawings, and other information. The GEIA may lead to one of four conclusions: (i) no detailed EIA is necessary, (ii) the project may be completed pursuant to specific conditions, (iii) a Detailed EIA is necessary, or (iv) project cancellation. The GEIA is free and usually takes up to 14-28 working days.

(ii) **Detailed EIA** (DEIA) – the scope is defined by the GEIA. The Detailed EIA report must be produced by a Mongolian company which is authorized by MET with a

special license to conduct DEIA. The developer of the DEIA should submit it to the MET (or Environmental department of corresponding province). An expert of MET who was involved in conducting the GEIA should make a review of the Detailed EIA within 18-36 working days and present it to MET (or Environmental department of corresponding province). Based on the conclusion of the expert, MET (or aimag government) takes a decision about approval or disapproval of the project.

(iii) The DEIA must contain the following chapters: (i) Project alternatives; (ii) Analysis of adverse impacts and their consequences; (iii) Recommendations for minimizing, mitigation and elimination of impacts; (iv) Ecological loss assessment (v) Risk assessment on human health and environment; (vi) Environmental Management Plan; (vii) Environmental Monitoring Program. The DEIA report must be consulted on with local bag residents at Citizens' meeting and obtain approval letter from the *bag* governor along with stamped meeting minutes.

33. The Project has been subject to a DEIA in accordance with Mongolian law; the DEIA is under preparation (May 2017). It is expected to be submission in July 2017 for approval. If there are any additional requirements on environmental mitigation measures from the approved DEIA, the IEE will be revised to reflect those.

C. Environmental Standards

34. **Ambient Water Quality**. Mongolia has national standards for a range of environmental parameters including water quality, noise and air quality. Table 3 shows the Mongolian standard for ambient water quality.

Table 3: Ambient surface water quality standard MNS 4586:1998

Parameter		MNS 4586-98
pH		6.5-8.5
DO	mgO/l	not less than 6&4 *
BOD	mgO/l	3
NH_4-N	mgN/l	0.5
NO_2-N	mgN/l	0.002
NO_3-N	mgN/l	9
PO_4-P	mgP/l	0.1
Cl	mg/l	300
F	mg/l	1.5
SO_4	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
Cr^{6-}	mg/l	0.01
Zn	mg/l	0.01
Hg	mg/l	0.1
Oil	mg/l	0.05

Parameter	MNS 4586-98	
Phenol	mg/l	0.001
Active and washing substances	mg/l	0.1
Benzapyren	Mkg/l	0.005

*DO>6 mgO/l for summer time and DO>4 mgO/l for winter time

Source: Mongolian Standards MNS 4586:1998

35. Mongolia has a network of air quality monitoring stations which analyze air quality data for comparison with national and international standards. The standards for Mongolia and World Health Organization (WHO) are in Table 4.

Table 4: Mongolian ambient air quality standards (MNS 4585: 2007) in comparison to WHO ambient air quality guidelines.

Pollutant	Averaging Period	Mongolian Standards ($\mu g/m^3$)	WHO Ambient Air Quality Guidelines	Averaging Period
Nitrogen Dioxide (NO_2)	20 Minute	85		
	1 hour	-	200	1 hour
	24 hour	40		
	Annual	30	40	Annual
Sulphur Dioxide (SO_2)	10 Minute	500		
	15 Minute	-		
	20 Minute	450		
	1 Hour	-		
	24 hour	20	20	24 hour
			125	24 hour IT-1
	Annual	10		
Particulate Matter (PM_{10})	24 hour	100	50	24 hour
			150	24 hour IT-1
	Annual	50	20	Annual
			70	Annual IT-1
Particulate Matter ($PM_{2.5}$)	24 hour	50	25	24 hour
			75	24 hour IT-1
	Annual	25	10	Annual
			35	Annual IT-1
Carbon Monoxide (CO)	30 Minute	60,000		
	1 hour	30,000	30	1 hour
	8 Hour	10,000		
Ozone (O_3)	8 hour	100	100	8 hour
			160	8 hour IT-1
Lead (Pb)	24 hour	1		
	Annual	0.5		
Hydrogen Chloride (HCl)	1 hour	-		

Source: Mongolian Law on Air

36. **Water Quality**. Table 6.

37.

38. **Table 5** summaries Mongolian ambient water quality standards (MNS 4585: 2007) and Table 6 summaries Mongolian drinking water standards MNS 0900: 2005, and

39. **Table 7** summarizes effluent wastewater quality standards MNS 4943: 2011. Mongolia's national standard for groundwater which is used as a drinking water supply is shown in Table 6.

Table 5: Mongolian ambient water quality standards (MNS 4585: 2007).

Parameter	Unit	Standard
(pH)		6.5-8.5
Dissolved Oxygen (O_2)	mgO/l	6&4 not less
BOD	mgO/l	3
COD	mgO/l	10
NH_4-N	mgN/l	0.5
NO_2-N	mgN/l	0.02
NO_3-N	mgN/l	9
PO_4- P	mgP/l	0.1
Chloride Cl	mg/l	300
Fluoride F	mg/l	1.2
SO_4	mg/l	100
Manganese Mn	mg/l	0.1
Nickel Ni	mg/l	0.01
Copper Cu	mg/l	0.01
Molybdenum Mo	mg/l	0.25
Cadmium Cd	mg/l	0.005
Cobalt Co	mg/l	0.01
Lead Pb	mg/l	0.01
Arsenic As	mg/l	0.01
Total Chromium Cr	mg/l	0.05
Hexavalent chromium (Cr^{6+})	mg/l	0.01
Zinc Zn	mg/l	0.01
Mercury Hg	mg/l	0.1
Mineral oil	mg/l	0.05
Phenol	mg/l	0.001

Source: Mongolian Standard MNS 4586:1998.

Table 6: Mongolian Drinking Water Standards (MNS 0900: 2005).

Parameter	Unit	Standard
Physical Quality		
pH	mg/l (milligrams/liter)	6.5-8.5
Hardness	mg equivalent/l	7.0
Total Dissolved Solids (TDS)	mg/l	1000.0
Turbidity	mg/l	1.5
Taste	Score	2.0
Odor	Score	2.0
Color	Degree	20
Inorganic Quality		
Molybdenum (Mo)	mg/l	0.07
Barium (Ba)	mg/l	0.7
Boron (B)	mg/l	0.5
Copper (Cu)	mg/l	1.0
Calcium (Ca2+)	mg/l	100.0
Magnesium (Mg2+)	mg/l	30.0
Manganese (Mn)	mg/l	0.1

Parameter	Unit	Standard
Sodium (Na)	mg/l	200.0
Phosphate (PO_4-)	mg/l	3.5
Fluoride (F)	mg/l	0.7-1.5
Selenium (Se)	mg/l	0.01
Strontium (Sr)	mg/l	2.0
Sulfate (SO_4-)	mg/l	500.0
Chloride (Cl)	mg/l	350.0
Arsenic (As)	mg/l	0.01
Hydrogen sulphide (H_2S)	mg/l	0.1
Chromium (Cr)	mg/l	0.05
Dry residue	mg/l	1000.0
Uranium (U)	mg/l	0.015
Beryllium (Be)	mg/l	0.0002
Cadmium (Cd)	mg/l	0.003
Total mercury (Hg)	mg/l	0.001
Total cyanide (CN-)	mg/l	0.01
Ammonium ion, (NH_4+)	mg/l	1.5
Nitrate ion, (NO_3-)	mg/l	50.0
Nitrite ions (NO_2-)	mg/l	1.0
Phosphate ions, (PO_{43}-)	mg/l	3.5
Silver (Ag)	mg/l	0.1
Iodine (I_2)	mg/l	1.0
Vinyl chloride	mg/l	0.0003
Nickel (Ni)	mg/l	0.02
Lead (Pb)	mg/l	0.01
Aluminum	mg/l	0.5
Antimony (Sb)	mg/l	0.02
Total iron (Fe)	mg/l	0.3
Zinc (Zn)	mg/l	5.0
Organic Quality		
Benzene	mg/l	0.01
Xylenes	mg/l	0.5
Nitrile 3 acetic acid	mg/l	0.2
2 chlorinated methane	mg/l	0.02
2 chlorinated ethane	mg/l	0.03
3 chlorinated ethane	mg/l	0.07
4 chlorinated ethane	mg/l	0.04
Phenolic compounds	mg/l	0.002
Styrene	mg/l	0.02
Toluene	mg/l	0.7
Ethyl benzene	mg/l	0.3
Pesticides		
Atrazine	mg/l	0.002
Carbofuran	mg/l	0.007
Lindane	mg/l	0.002
Molinat	mg/l	0.006
Endrin	mg/l	0.00006
Microbial Quality		
Total Coliform	Coli / ml	100 (at source) 20 (at supply)
E.Coli	E.Coli / 100 ml	E.Coli / 100 ml
Radiological Quality		
Total α radioactivity	Bq/l	0.1
Total β radioactivity	Bq/l	1.0

Source: Mongolian Standard MNS 0900: 2005.

Table 7: Mongolian effluent wastewater quality standard (MNS 4943: 2011)

Parameter	Unit	Standard
Water temperature	Co	20
pH	-	6-9
Odor	Sense	No smell
Total Suspended Solids (TSS)	mg/l	50
BOD	mg O2/l	20
COD	mg O2/l	50
Permanganate oxidizing capacity	mg O2/l	20
Total Dissolved Solids (TDS)	mg/l	1,000 *
Ammonia Nitrogen (NH4)	mg N/l	6
Total Nitrogen (TN)	mg/l	15
Total phosphorous (TP)	mg/l	1.5
Organic phosphorous (DOP)	mg/l	0.2
Hydrogen sulphide (H2S)	mg/l	0.5
Total iron (Fe)	mg/l	1
Aluminum (Al)	mg/l	0.5
Manganese (Mn)	mg/l	0.5
Total Chromium (Cr)	mg/l	0.3
Hexavalent chromium (Cr6+)	mg/l	Absent
Total cyanide (CN)	mg/l	0.05
Free cyanide	mg/l	0.005
Copper (Cu)	mg/l	0.3
Boron (B)	mg/l	0.3
Lead (Pb)	mg/l	0.1
Zinc (Zn)	mg/l	1
Cadmium (Cd)	mg/l	0.03
Antimony (Sb)	mg/l	0.05
Mercury (Hg)	mg/l	0.001
Molybdenum (Mo)	mg/l	0.5
Total Arsenic (As)	mg/l	0.01
Nickel (Ni)	mg/l	0.2
Selenium (Se)	mg/l	0.02
Beryllium (Be)	mg/l	0.001
Cobalt (Co)	mg/l	0.02
Barium (Ba)	mg/l	1.5
Strontium (Sr)	mg/l	2
Vanadium (V)	mg/l	0.1
Uranium (U)	mg/l	0.05
Oil and grease	mg/l	1
Fat	mg/l	5
Surface active agents	mg/l	2.5
Phenol (C_6H_5OH)	mg/l	0.05
Trichloroethylene (C_2HCl_3)	mg/l	0.2
Tetrachloroethylene	mg/l	0.1
Chlorine remains (Cl)	mg/l	1
Bacteria triggering water-borne disease	-	Absent in 1 mg of water

Source: Mongolian Standard MNS 4943: 2011.

Table 8. Groundwater quality standard MNS 900:2005

Parameter	MNS 900:2005		WHO Guidelines for Drinking Water Quality, Fourth Edition. 2011	
Na^+	mg/l	200		None established
K^+	mg/l	200		None established
Ca^{2+}	mg/l	100		-
Mg^{2+}	mg/l	30		-
SO_4^{2-}	mg/l	500		None established
HCO_3	mg/l	-		-
CO_3^{2-}	mg/l	-		-
Cl	mg/l	350	mg/l	5
P	mg/l	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		1000		-
Hardness	mg-eqv/l	7		None established
Acidity potential	mB			-
Solid remains	g/l	1		-
NH_4	mg/l	1.5		None established
NO_3	mg/l	50	mg/l	50
NO_2	mg/l	1	mg/l	3
PO_4	mg/l	3.5		-
As	mg/l	0.01	mg/l	0.01
Fe	mg/l	0.3		None established
Pb	mg/l	0.03	mg/l	0.01
Ni	mg/l	0.02	mg/l	0.07
Cr	mg/l	0.05	mg/l	0.05
Cu	mg/l	0.1	mg/l	2
Zn	mg/l	5		None established
Mn	mg/l	0.1		None established
Cd	mg/l	0.003	mg/l	0.003
Hg	mg/l	0.0005	mg/l	0.006
B	mg/l	0.5	mg/l	2.4
Ba	mg/l	0.7	mg/l	0.7
Mo	mg/l	0.07		None estabished
Se	mg/l	0.01	mg/l	0.04
E.coli or thermotolerant coliform bacteria		-		Must not be detectable in any 100 ml sample.

Source: Mongolian Standards MNS 900:2005

40. **Noise.** Mongolian noise standards are included in Ambient Air Quality Standards MNS 4585:2007 and set an allowable limit for noise in daytime (7am-10pm) at 60 dB, and night at 45 dB, with day and night measurements on 16-hour and 8-hour averages respectively. These standards can be compared to the more detailed WHO guidelines which recommend that indoor noise levels should not exceed 30 dB (average equivalent over 8 hours LA_{eq}) and 45 dB (maximum for an individual noise event), and outdoor sound levels should not exceed 50 dB LA_{eq}.

41. As for construction noise, IFC EHS Guideline: Occupational health and safety standards indicates IFC EHS Guideline: Occupational Health and Safety: 85 (Equivalent level LAeq,8h) 110 (Maximum LAmax,fast).

D. Specially Protected Areas

42. **Specially Protected Areas (SPA)**. In 1994, the protected area system was consolidated and formalized through the Law on Special Protected Areas. Under this law, Mongolia has a national system of protected areas, called Special Protected Areas, covering 22 million hectares, equivalent to almost 14% of the country. The Law on Special Protected Areas provides for four categories of protected areas: 1) Strictly Protected Areas; 2) National Parks; 3) Nature Reserve Area; and 4) Natural Monuments.

43. Strictly Protected Areas and National Parks are managed by the Central Administration Unit of SPAs under MET while Natural Reserve Areas and Natural Monuments are managed by local governments (province and soum).

44. **Nature Reserves** are further classified into four sub-categories: 1) Ecological Reserves; 2) Biological Reserves; 3) Paleontological Reserves; and 4) Geological Reserves. In addition, the Law on Buffer Zones requires the establishment of Buffer Zones outside Strictly Protected Areas. In addition, local *soum* authorities may establish Buffer Zones around Nature Reserves and Natural Monuments[16]

E. Laws on Wildlife and Habitat Protection

45. Law on Fauna (last amended in 2012) and Law on regulation of export and import of endangered species (in 2002) are the key laws protecting wildlife. In addition, Mongolia became a signatory party to the Convention on the Conservation of Migratory Species of Wild Animals in 1999.

F. Mongolia's Occupational Health and Safety Standards

46. 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.

G. Strategic Transport Policy

47. The Government of Mongolia in conjunction with external supporting organizations such as ADB have created a number of strategies and policies for the transport sector which focus on long term goals and estimated budgets. Such strategy documents include the National Development Strategy 2007-2021, the National Transport Strategy for Mongolia, "Transit Mongolia" program which ended in 2015, and the Mongolian Road Master Plan 2008-202017.

48. **Asian Highway.** The Asian Highway project was initiated in 1959. Intergovernmental Agreement on the Asian Highway Network was adopted on 18 November 2003 and is an important tool to facilitate international trade and tourism, promote regional integration and

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[16] UNDP Project Document: Strengthening of the Protected Area Network in Mongolia (SPAN) (2010).

[17] Ministry of Road, Transport, Construction and Urban Development presentation ''Road, Transport Sector Mongolia'' Presentation to UNESCAP for Operationalization of international intermodal transport corridors in North-East and Central Asia, Bishkek Meeting. See http://www.unescap.org/ttdw/common/TIS/CorridorStudy/EGM_Bishkek/7-Mongolia.pdf

enhance international cooperation. The Government of Mongolia signed the Agreement in 2004. The project roads are part of the Asian Highway network of 141,000 km of standardized roads across Asia. The purpose of the network is to increase connectivity and develop trade across Asia.

III. DESCRIPTION OF THE PROJECT

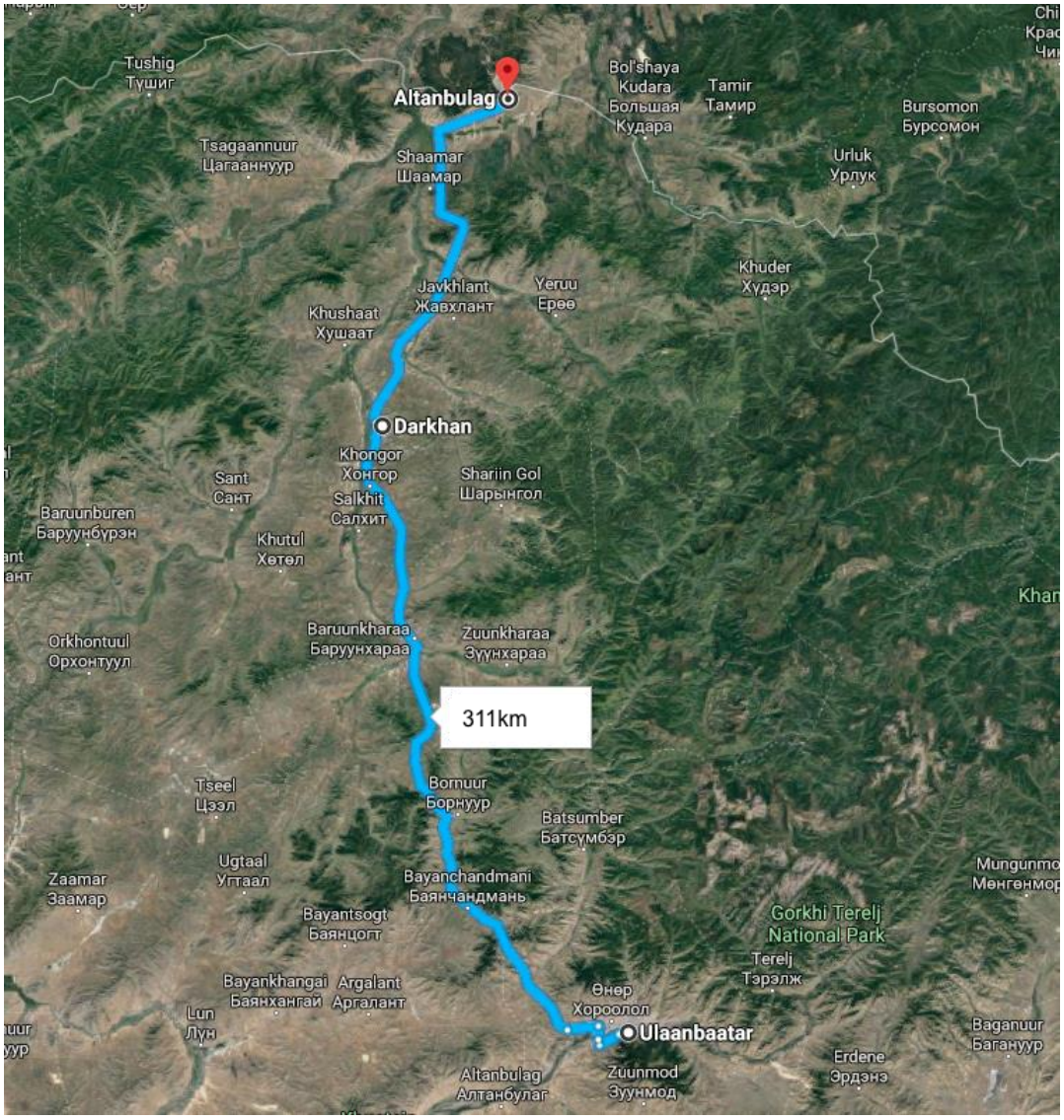
49. The project consists of three outputs: (i) Road asset management capacity improved; (ii) road condition improved; and (iii) road safety improved. In accordance of the ADB SPS (2009) requirements, output 2 requires for environmental safeguards due diligence. Thus, the scope of this IEE focuses on output 2.

A. Detailed Description of the Project

50. Output 2 will preserve and improve important regional road sections that link the PRC and the Russian Federation through Mongolia's capital and comprises part of CAREC road corridor 4b. The project will improve 311 kilometers (km) of existing national highway sections comprising Ulaanbaatar–Darkhan (193 km) and Darkhan–Altanbulag (118 km). Improvement works will include (i) pavement treatment and (ii) widening of carriageways and shoulders within the existing ROW. The location of the project is shown in

51. Figure 3.

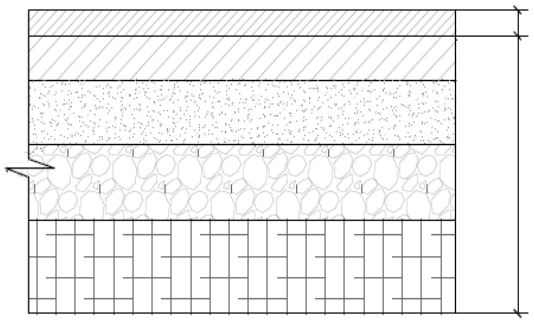
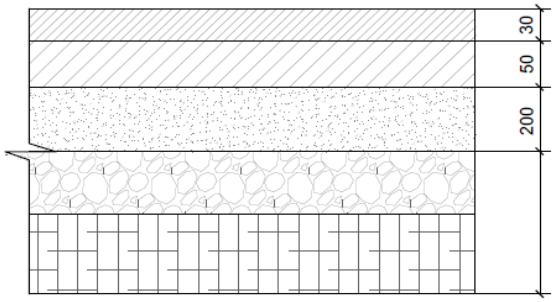
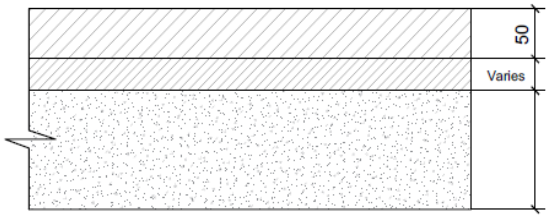
Figure 3: Project Location



Source: Google earth map, ADB PPTA team (2017)

52. The project involves road maintenance and rehabilitation works. Routine **maintenance works** typically include pothole patching and crack sealing. Three types of road **rehabilitation works** are also involved in the project: (i) surface dressing; (ii) in-situ stabilization; and (iii) asphalt concrete (AC) overlay, depending on the levels of road conditions. Specification of asphalt and concrete mix design will be selected suitable to extreme weather conditions in Mongolia. Important factors are (i) bitumen binder should be resistant to wider temperature range and (ii) aggregates (sand, gravel, cement) must be hard and frost resistant so that subgrade and basecourse will be protected from climate impacts. During the detailed engineering design stage, identification of types of works will be further carried out and confirmed.

Figure 4. Technical drawings of three types of road rehabilitation works

Surface dressing		
In-situ stablization		
Asphalt concrete overlay		

Source: ADB PPTA consultant (2017)

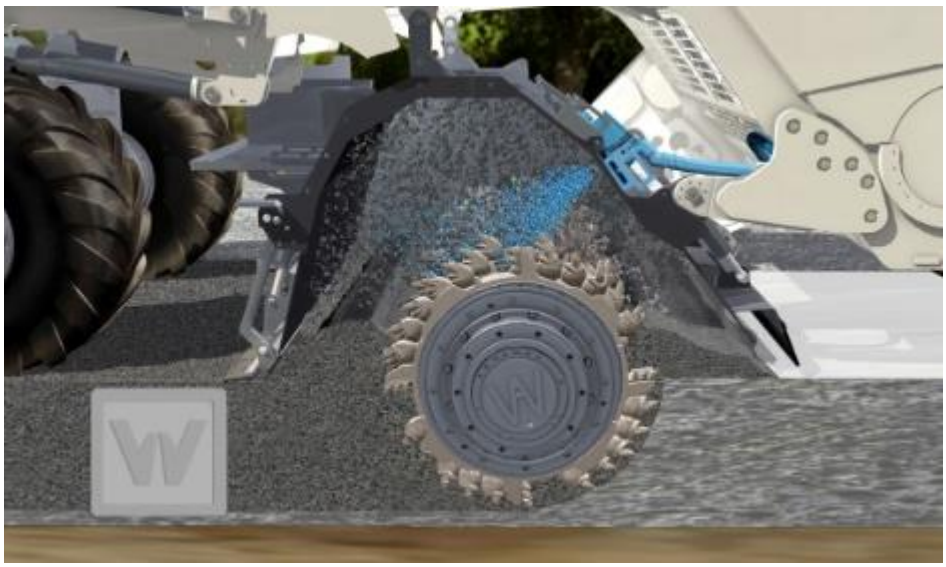
53. **Surface dressing.** This process entails spraying the road with bitumen and covering it with stone chippings. The dressing is then rolled, which together with the actions of slow moving traffic, embeds the stone chips into the surface. Surface dressing is applied to rejuvenate existing asphalt concrete surface and to seal residual cracking.

Figure 5. Typical look of surface dressing

Source: Wikipedia

54. **In-situ stabilization.** In-situ stabilization is applied when existing crushed stone aggregate base course is failed. In-situ stabilization applies soil stabilization and cold recycling technologies. It uses milling and mixing rotor to granulate the damaged pavement layers, and simultaneously mixes with binding agents (cement is used here). The resulting homogeneous construction material is finish-graded and then compacted by rollers. As it recycles existing materials and adds small quantities of binding agents (concrete is used for this project), in-situ stabilization is a resource-efficient process and a fast-paced method that minimizes space requirements and shortens construction time, which results in less disturbance in road traffic.

Figure 6. Sample image of In-situ stabilization process



Source: ADB PPTA team (2017)

55. **Asphalt concrete overlay.** In the existing concrete pavement, asphalt concrete overlay will be applied to improve ride quality and extend the life of road.

Figure 7. Typical look of asphalt concrete overlay

Source: Wikipedia

56. **Climbing lane construction.** To ease spot road congestion and improve road safety, a following climbing lanes will be constructed, which are presented in the table below. Final confirmation on the number of climbing lanes will be determined during the detailed engineering design stage. It involves widening existing embankment within the existing road right-of-way, constructing new sub-base and base course; and asphalt concrete surfacing. Specific design feature of climbing lanes will be finalized during the detailed design stage.

Table 9: Location of Climbing Lanes (Ulaanbaatar–Darkhan-Altanbulag)

From (Km)	To (Km)	Length (km)	North/ southbound
Ulaanbaatar-Darkhan			
26.30	27.30	1.00	Northbound
50.00	52.10	2.10	Northbound
130.80	132.80	2.00	Northbound
156.00	156.50	0.50	Northbound
52.10	53.50	1.40	Southbound
59.30	60.30	1.0	Southbound
121.40	122.80	1.40	Southbound
132.80	135.20	2.40	Southbound
Darkhan-Altanbulag			
226.500	227.200	0.700	Northbound
270.400	272.600	2.200	Northbound
286.500	288.600	2.100	Northbound
251.000	251.700	0.700	Southbound
272.600	276.200	3.600	Southbound
288.600	289.400	0.800	Southbound

Source: ADB PPTA consultant (2018)

B. Associated Facilities

57. SPS (2009) defines associated facilities as "facilities that are not funded as part of a project but whose viability and existence depend exclusively on the project, or whose goods or services are essential for successful operation of the project." In this context, the project does not involve any associated facility at this stage. However, if the project will use any existing asphalt mixing plants, they will be considered as associated facilities. The decision will be made during the project implementation.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Project Area of Influence

58. The project road corridor was visited for the preparation of this IEE, with particular attention paid to:

(i) Sensitive natural environmental receptors such as water bodies, biodiversity and wildlife habitats;
(ii) Sensitive human receptors;
(iii) Cultural and heritage sites; and
(iv) Potential health and safety issues.

59. According to SPS 2009 the project area of influence is defined as follows:

(i) **Primary project site(s) and related facilities**. This is the corridor alignment of the project which is within the existing right of way which in Mongolia extends to 50 m either side of the road curb.
(ii) **Areas and communities potentially affected by cumulative impacts** from further planned development of the project. The communities around the project area are principally those concentrated in the main towns primarily 61th railway station (Songinokhairkhan district of UB); Bayanchandmani soum center (Tov aimag); Baruunkharaa soum center (Selenge aimag); Darkhan city (Darkhan-Uul province); Darkhan (Darkhan-Uul aimag); and Sukhbataar and Altanbulag (Selenge aimag). In addition, nomadic herders move around the project area depending on the time of year.

B. Geography, Topography and Geology

1. Administration.

60. Administratively, Mongolia is divided into 21 *aimags* (provinces) and the capital city Ulaanbaatar. *Aimags* are divided into *soums* which are further divided into bags. The section between Ulaanbaatar and Darkhan traverses the aimags of Darkhan-Uul, Selenge, Tov and Ulaanbataar municipality. The section between Darkhan and Altanbulag traverses Darkhan-Uul aimag and Selenge aimag.

2. Topography and soil conditions

61. Topography and soil conditions for UB-Darkhan road corridor that are provided here are based on field visit results and collection of previous survey results conducted in the region by the environmental specialist for the project. Topography and soil conditions for Darkhan-

Altanbulag road corridor was based on field survey results carried out by a licenced EIA institute hired by ADB commissioned PPTA Team.

62. **UB-Darkhan road corridor:** The landscape between Ulaanbaatar city and the Darkhan city is described as low mountains, passes, plains and sloping depressions in the valleys between the mountains. A previous soil survey was made at 5 locations as shown in Table 910.

Figure 8: *Topography of* UB-Darkhan road corridor

Source: ADB PPTA consultant (2018)

63. The predominant soil type distributed for most parts of the corridor between UB and Darkhan is brown soil. Mountainy brown soil type was observed in elevated areas and uplands such as Takhilt pass, Baruunturuun pass, Khairtkhaan pass and 52th km pass. Soil type of meadow steppe is observed in the southern and midway parts of the road corridor in Bornuur, Jargalant and Bayanchamdmani soums of Tuv province and Mandal and Baruunkharaa soums of Selenge province. Brown soil type of desert-steppe is observed in the northern section of the road corridor in Darkhan-Uul province and Khongor soum. In all locations sampled, the 0-20cm sample contained loamy soils, except location 2 where loam was not present. From beyond 10-15 cm, soil was classified as non-rizosphere and in the majority of samples, the presence of rock increased from approximately 20 cm.

Table 10: Soil Sampling Locations along the UB-Darkhan Road Corridor

No.	Soil sampling location	Coordinates	
		Latitude	Longitude
1	Bayanchandmani soum, nearby Kharmodot pass	48.15902	106.386
2	Jargalant, Bornuur soums,nearby Morin Tolgoi	48.51121	106.137
3	Near by Boroo gold, Mandal soum	48.77915	106.1091
4	Khongor soum	49.21912	106.0481
5	Nearby Uzuur Ulaan, Darkhan-Uul province	49.04178	106.0495

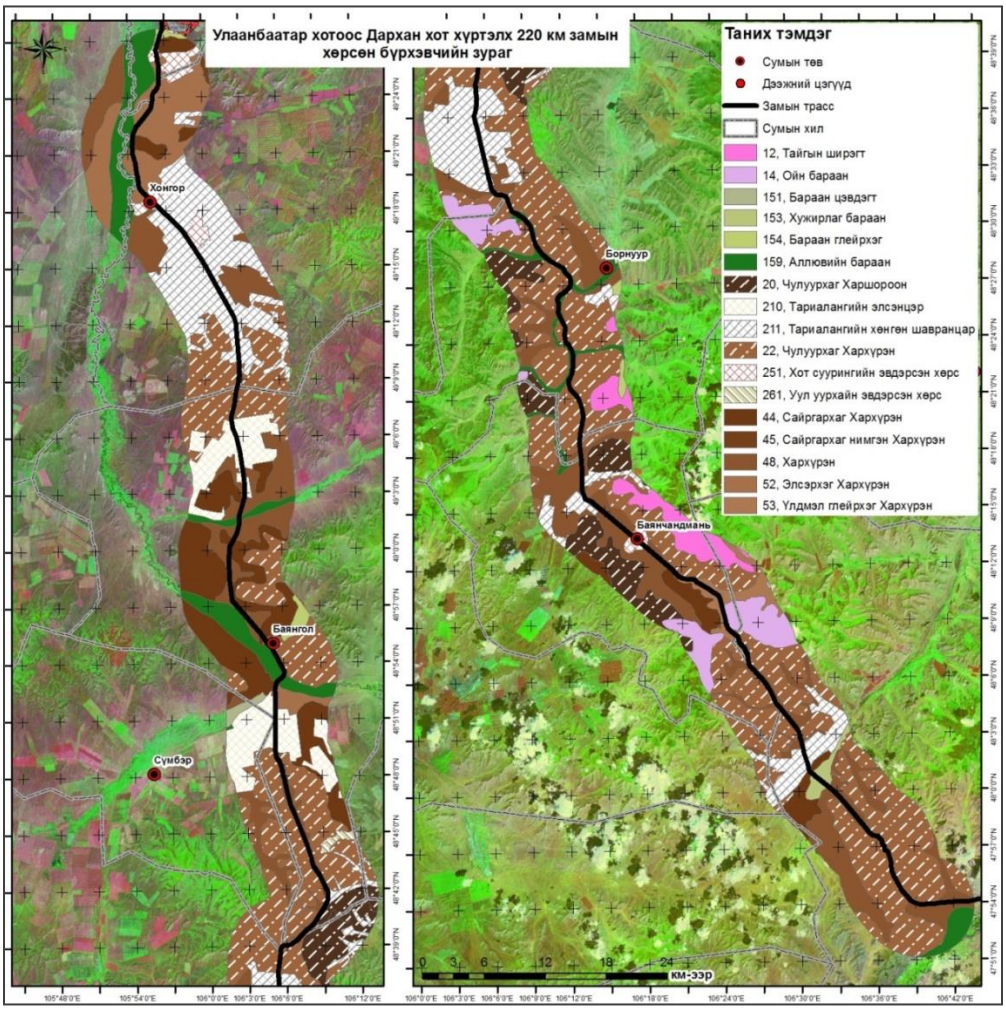
Source: Eco-Sphere LLC, survey in 2017

Figure 9. Soil sampling spot along the UB-Darkhan road.

Source: ADB PPTA consultant (2018)

64. A map indicating the soil characteristics in the road corridor is shown in Figure 10.

Figure 10: UB-Darkhan Road Soil Classification



Source: Eco-Sphere LLC, survey in 2017

Table 11: Soil Analysis Results at the UB-Darkhan Corridor

Sampling No.	Depth, cm	*pH	$CaCO_3$ %	Humus %	*EC	Mobile Phosphorous & Potassium mg/100g	
						P_2O_5	K_2O
01	0-32	8.13	12.0	1.724	0.126	1.04	11.6
02.	32-64	8.23	11.27	1.348	0.175	1.42	14.8
	0-12	6.35	0.0	5.327	0.334	3.94	21.8
	12-↓	5.93	0.0	2.273	0.023	1.71	8.3
03.	0-15	8.18	0.0	4.968	0.12	3.75	16.5
	15-35	8.24	3.27	2.760	0.1	1.72	12.7

Source: Eco-Sphere LLC, 2017

65. **Darkhan-Altanbulag corridor:** The topography of the corridor is undulating with plains and valleys with low mountains. Typical examples of topography are given in Figure 81.

Figure 81: Topography Darkhan-Altanbulag corridor

Source: ADB PPTA consultant (2018)

66. A baseline soil survey was conducted along the Darkhan-Altanbulag road corridor by the DEIA team and included soil sampling in six locations; soil chemical analysis was undertaken at the soil laboratory of the Geo-Ecological Institute of Mongolia. The location of the soil sampling is provided in

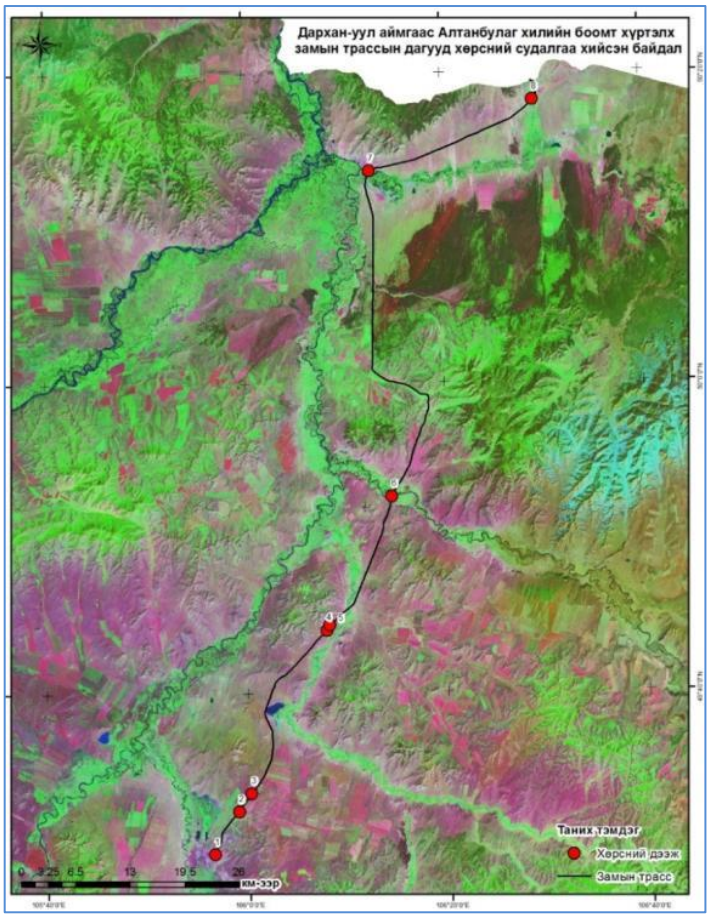
67. Table 122 and shown in Figure 12.

Table 12: Soil Sampling Locations Darkhan-Altanbulag corridor

No.	Landscape feature and km mark	Coordinates	
		Latitude N	Longitude E
1	Start point of the Darkhan-Altanbulag road, STA.226	49° 29’ 37.4”	105°56’28.5”
2	STA.232, in a valley	49° 32’ 24.1”	105°58’ 55.7”
3	STA.248, nearby a mountain	49° 44’ 02.4”	106° 07’ 51.1”
4	STA.248, nearby a mountain (contaminated site)	49° 44’ 23.6”	106°08’08.9”
5	STA.276, nearby a river	49° 52’ 39.5”	106° 14’ 33.7”
6	STA.345, nearby a river near Altanbulag town	50° 18’ 09.8”	106° 29’ 16.8”

Source: Eco-Sphere LLC, 2017

Figure 12: Sampling Location Map-Darkhan-Altanbulag corridor

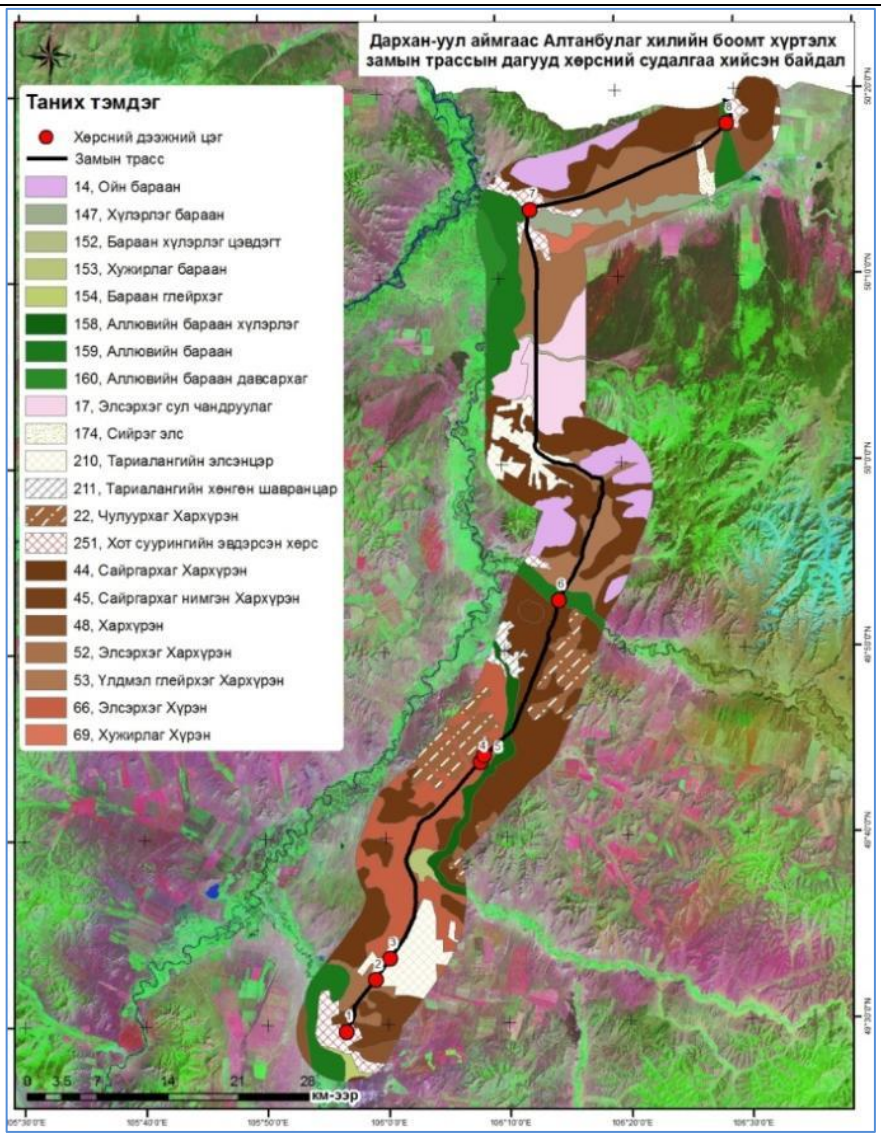


Key: Black line = road alignment, Red dots = sampling locations

Source: Eco-Sphere LLC, 2017

68. Based on the soil field survey information and landsat map data, the DEIA team developed soil characteristics map for the road corridor shown in Figure . The soil characteristics map indicates that the predominant soil types are meadow soil and dark brown soil.

Figure 13: Soil Characteristics Darkhan-Altanbulag Corridor



KEY
14 Forest dark soil
147 Dark soil with peat /permafrost
153 Dark soil with solonchak
154 Dark soil with clay
158 Alluvial dark soil with peat
159 Alluvial dark soil
160 Alluvial dark soil with salt
17 Sandy
174 Sparsely sand
210 Agricultural sandy soil
211 Agricultural loamy soil
22 Stony Dark Kastanozem soil
251 Eroded soil by urban
44 Gravelly Dark kastanozem soil
45 Gravelly, shallow Dark kastanozem soil
48 Dark Kastanozem
52 Sandy, Dark Kastanozem
53 Residual Dark Kastanozem with clay
66 Sandy Kastanozem
69 Kastanozem soil with Solonchak

Source: Eco-Sphere LLC, 2017

69. In terms of chemical analysis, the following parameters were tested, noting that the DEIA team determined that given the soil conditions, heavy metal analysis was not considered necessary, see **Error! Reference source not found.**3 for results.

Table 13: Soil Analysis Results at Darkhan-Altanbulag Corridor

Sampling No.	Depth, cm	*pH	$CaCO_3$ %	Humus %	*EC	Mobile Phosphorous & Potassium mg/100g	
						P_2O_5	K_2O
01	0-10	7.73	1.94	0.676	0.185	0.86	13.9
02.	0-30	7.54	0.00	0.928	0.050	1.11	17.1
	30-48	7.51	0.00	1.045	0.050	1.23	11.7
	48	7.43	0.00	0.913	0.054	1.10	9.8
03.	0-25	7.59	1.82	1.638	0.089	1.82	16.4
	25-37	7.85	9.09	0.692	0.095	0.88	9.1
04	0-10	7.72	1.09	2.192	0.112	2.38	23.6
05	0-13	7.37	1.45	2.962	0.074	3.15	33.7
	13-30	7.86	0.24	1.589	0.098	1.77	15.7
06	0-10	7.58	0.61	1.604	0.234	1.79	16.0

* pH soil : water (1 : 2.5) pH meter
*EC – Electrical Conductivity measured in deciSiemen per meter (dS/m)
Source: Eco-Sphere LLC, 2017

70. Sampling location number 4 found waste construction materials such as gravel, asphalt and domestic waste left in an area of around 300 m^2, contaminating the topsoil; it was noted to be from previous construction or rehabilitation activities.

C. Meteorology and Climate

71. Weather stations in Mongolia are limited and climate data presented here is from Ulaanbaatar, Bayanchandmani, Baruunkharaa, Darkhan, Orkhon and Sukhbaatar weather stations measuring key climate parameters over the last 15 years.

72. **Precipitation**. In general the project areas are in regions with relatively low precipitation and moisture, where the majority of precipitation occurs in summer months. Precipitation in winter months constitutes only 5-7% of total annual precipitation. Between April and October, there are about 50-60 days of rain on average, (see

73. 14-15). With regards to flooding, major flood events occur 1-2 times per 60 years. During such events, 46-79mm precipitation falls as rain and causes flood the flood events. Snow falls primarily between November and March, during which time there are approximately 35-45 snowy days on average. Given the temperatures, the land surface is covered with snow for approximately 110-130 days a year.

Table 14: Mean precipitation by months (2011-2015 period), mm, UB-Darkhan corridor

Location	Months												Year total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	2.2	2.5	4.0	8.4	18.6	48.5	67.5	66.2	27.6	8.6	5.2	3.4	262.5
Bayanchandmani	1.3	1.2	3.5	7.3	26.2	50.6	68.2	71.8	27.1	5.8	3.5	2.8	266.2
Baruunkharaa	3.4	2.7	3.7	9.0	23.8	53.4	74.8	74.0	34.4	10.8	6.7	4.9	301.4

Table 15: Mean precipitation by months (2011-2015 period), mm, Darkhan-Altanbulag corridor

Location	Months												Year total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon soum	2.9	2.2	3.0	6.8	23.0	61.5	74.3	78.2	34.9	9.5	5.3	4.8	306.3
Darkhan city	4.0	3.2	4.3	12.3	27.2	58.6	72.3	84.0	36.8	14.4	7.8	5.7	330.7
Sukhbaatar town	3.2	2.4	2.9	9.9	22.3	50.7	69.7	72.6	34.0	11.0	5.7	3.9	288.3

Table 16: Average moisture (2011-2015 period), mm, UB-Darkhan corridor

Location	Months												Year total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	77	73	61	49	46	54	61	63	59	60	70	77	62
Bayanchandmani	72	67	62	49	48	57	65	65	58	58	67	70	61
Baruunkharaa	78	76	64	50	48	57	65	67	64	65	73	79	65

Table 17: Average moisture (2011-2015 period), mm, Darkhan-Altanbulag

Location	Months												Year total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon soum	81	79	69	52	51	60	69	71	68	68	76	81	69
Darkhan city	83	80	69	54	53	63	72	75	71	71	78	84	71
Sukhbaatar town	76	72	61	48	48	57	66	68	66	65	72	76	64

Table 18: Snow days by Month, UB-Darkhan corridor

Name of weather stations	Cold months									Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Ulaanbaatar	0.1	4.4	7.1	8.1	4.4	2.8	4.3	3.6	0.4	35.3
Bayanchandmani	0.4	5.8	8.9	9.1	7.0	4.1	4.5	4.4	0.9	45.0
Baruunkharaa	1.4	4.0	5.3	5.9	5.9	4.0	4.1	3.1	2.1	35.8

Table 19: Snow days by Month, Darkhan-Altanbulag corridor

Name of weather stations	Cold months									Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Sukhbaatar	1.4	4.1	6.7	6.1	5.5	3.9	4.8	4.0	1.4	37.9
Orkhon	2.1	4.9	5.7	6.7	5.2	4.2	4.8	3.0	1.7	38.3
Darkhan	0.4	3.8	6.9	8.9	5.9	5.4	4.4	6.6	1.5	43.5

74. **Temperature.** The project region is characterized by a harsh and cold continental climate which means long winters and sharp fluctuations of air temperature between day and night. Tables 20 to 25 show the mean, maximum and minimum air temperatures for the region.

Table 20: Mean air temperature,^{0}C, UB-Darkhan corridor

Weather stations	Months												Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	-21.6	-17.3	-8.1	1.7	9.7	15.5	17.8	15.7	9.1	0.5	-11.0	-19.2	-0.6
Bayanchandmani	-19.1	-15.1	-7.1	2.2	9.5	15.3	17.8	15.8	9.3	1.0	-9.4	-16.6	0.3
Baruunkharaa	-24.8	-20.4	-7.7	3.3	11.3	17.1	19.4	17.2	10.1	1.0	-10.9	-21.0	-0.4

Table 191: Mean air temperature,^{0}C, Darkhan-Altanbulag corridor

Weather stations	Months												Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon	-25.0	-20.4	-8.1	3.6	11.2	17.3	19.5	16.9	9.8	0.9	-11.0	-21.3	-0.6
Darkhan	-23.8	-18.6	-6.4	4.2	11.8	17.7	20.1	17.7	10.6	2.1	-9.8	-19.9	0.5
Sukhbaatar	-22.9	-18.3	-6.8	3.8	11.4	17.6	19.9	17.4	10.3	1.5	-9.9	-19.4	0.4

Table 202: Maximum air temperature,^{0}C, UB-Darkhan corridor

Weather stations	Months												Max
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	-1.8	11.1	18.3	27.3	32.6	38.3	38.2	34.6	31.7	22.5	13.0	12.1	38.3
Bayanchandmani	12.4	9.1	20.5	28.3	34.4	37.7	38.4	35.7	31.3	21.1	12.6	3.1	38.4
Baruunkharaa	1.9	12.6	21.8	30.2	36.0	39.1	42.8	38.8	32.5	27.0	17.5	8.4	42.8

Table 213: Maximum air temperature (unit: ^{0}C) at Darkhan-Altanbulag corridor

Weather stations	Months												Max
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon	5.6	10.5	22.9	30.9	36.5	39.8	43.4	39.1	33.0	28.3	19.1	10.4	43.4
Darkhan	-2.0	8.7	23.4	31.2	36.5	40.4	42.6	38.2	33.5	27.2	16.4	7.0	42.6
Sukhbaatar	-2.8	11.7	22.6	31.6	35.0	39.4	42.5	38.1	31.9	27.0	12.5	12.3	42.5

Table 224: Minimum air temperature (unit: ^{0}C) at UB-Darkhan corridor

Weather stations	Months												Min
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	-33.2	-29.9	-22.4	-16.7	-8.0	1.0	7.3	3.3	-8.8	-12.7	-30.2	-30.4	-33.2
Bayanchandmani	-34.6	-34.7	-24.7	-19.1	-9.7	-1.1	4.6	0.1	-14.2	-13.5	-30.5	-29.8	-34.7
Baruunkharaa	-37.7	-36.6	-27.5	-15.8	-6.1	1.0	7.8	2.3	-11.4	-13.8	-31.5	-34.9	-37.7

Table 235: Minimum air temperature(unit: ^{0}C) at Darkhan-Altanbulag corridor

Weather stations	Months												Min
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon	-39.2	-39.6	-28.3	-15.1	-6.6	-1.2	7.1	2.8	-13.1	-13.4	-31.1	-35.7	-39.6
Darkhan	-36.0	-35.4	-23.6	-11.1	-3.8	1.1	9.5	5.1	-8.5	-10.8	-26.7	-31.3	-36.0
Sukhbaatar	-37.8	-38.4	-27.1	-12.6	-6.6	-0.5	9.0	3.8	-7.4	-12.8	-31.5	-35.1	-38.4

75. **Wind.** Based on the last 15 years' climate data, dust or snow storms occur on around 10-24 days a year. The predominant wind direction is from northwest to south east. Dust storms usually occur in April and May. The average wind speeds are shown in Tables

Table 26: Average wind speed (unit: m/sec) at UB-Darkhan corridor

Weather stations	Months												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	·
Ulaanbaatar	1.3	1.8	2.5	3.3	3.4	3.1	2.7	2.5	2.5	2.2	1.7	1.4	2.4
Bayanchandmani	2.0	2.4	3.3	4.2	4.3	3.5	3.0	3.0	3.3	3.0	2.6	2.2	3.1
Baruunkharaa	1.4	1.5	2.1	2.8	2.8	2.3	1.8	1.8	2.1	1.9	1.7	1.5	2.0

76. Table 2

76. 26 to 31.

Table 26: Average wind speed (unit: m/sec) at UB-Darkhan corridor

Weather stations	Months												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	·
Ulaanbaatar	1.3	1.8	2.5	3.3	3.4	3.1	2.7	2.5	2.5	2.2	1.7	1.4	2.4
Bayanchandmani	2.0	2.4	3.3	4.2	4.3	3.5	3.0	3.0	3.3	3.0	2.6	2.2	3.1
Baruunkharaa	1.4	1.5	2.1	2.8	2.8	2.3	1.8	1.8	2.1	1.9	1.7	1.5	2.0

Table 27: Average wind speed (unit: m/sec) at Darkhan-Altanbulag corridor

Weather stations	Months												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	·
Orkhon	0.4	0.7	1.6	2.6	2.5	2.0	1.5	1.4	1.6	1.4	0.8	0.5	1.4
Darkhan	0.7	1.0	2.0	2.9	2.7	2.3	1.7	1.6	1.8	1.7	1.3	0.8	1.7
Sukhbaatar	1.2	1.3	2.0	2.9	2.8	2.3	1.9	1.8	1.9	1.8	1.6	1.4	1.9

Table 248: Number of days with dust storm at UB-Darkhan corridor

Weather stations	Months												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	·
Ulaanbaatar	2.09	1.6	2.2	4.8	6.1	4.5	3.7	3.3	2.4	2.0	1.3	1.1	23.4
Bayanchandmani	1.4	1.3	1.9	2.7	3.6	2.9	1.8	1.0	1.1	1.5	1.4	1.3	10.7
Baruunkharaa	1.5	1.0	1.6	2.9	3.1	1.8	1.8	2.0	1.2	1.3	1.5	1.0	7.5

Table 29: Number of days with dust storm at Darkhan-Altanbulag corridor

Weather stations	Months												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	·
Orkhon	1	1.2	2.0	3.1	4.2	2.8	2.1	2.0	1.4	2.0	2.5	1.5	9.8
Darkhan	1	1.5	2.7	6.3	6.7	5.0	3.9	4.6	2.3	2.9	1.8	1.0	28.9
Sukhbaatar	1.5	1.7	2.6	3.9	4.9	3.6	3.2	2.9	3.2	2.7	1.5	1.8	14.4

Table 30: Number of days with snow storm at UB-Darkhan corridor

Weather stations	Months												Ave.
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ulaanbaatar	4.2	3.6	4.5	6.3	4.5	4.7	7.3	8.8	5.5	4.2	1.0		39.1
Bayanchandmani	4.6	5.9	10.1	8.3	6.8	8.0	15.6	13.8	4.6	1.0			63.7
Baruunkharaa	1.0	1.8	2.2	2.7	2.4	1.9	3.2	3.6	1.9				10.6

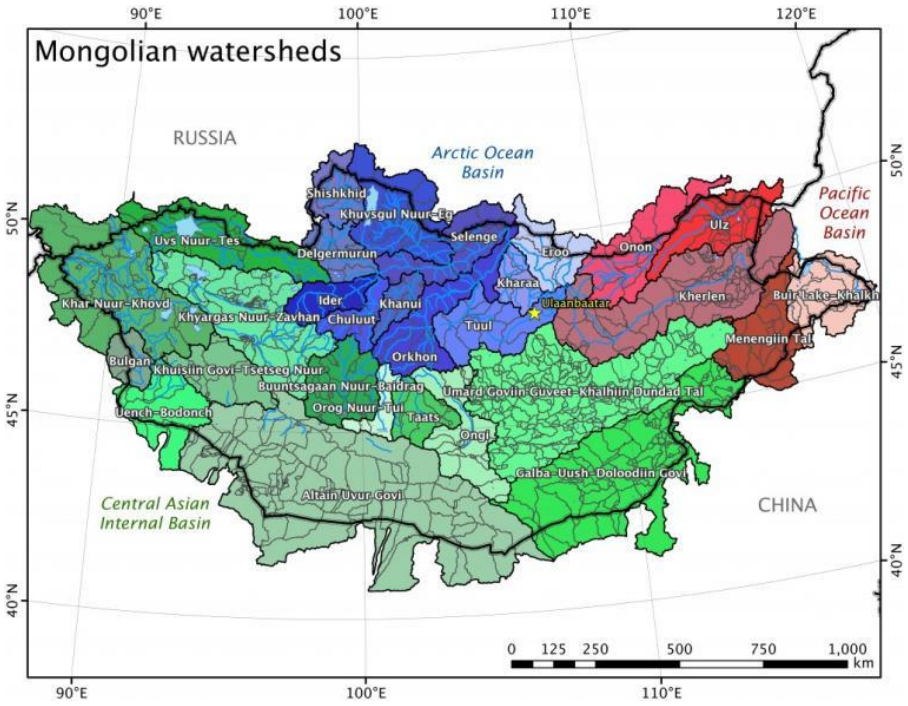
Table 31: Number of days with snow storm at Darkhan-Altanbulag corridor

Weather stations	Months												Ave.
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Orkhon	5.5	2.5	2.8	3.0	2.6	2.8	4.8	3.7	2.0	2.0			14.5
Darkhan	3.1	5.0	5.4	4.5	5.3	4.6	7.1	6.8	3.1				33.7
Sukhbaatar	2.0	2.6	3.5	2.0	2.2	2.5	3.7	5.3	2.4			1.0	13.8

D. Hydrology, Surface and Ground Water

77. **General Hydrology**. Both UB-Darkhan corridor and Darkhan-Altanbulag corridor drain to the Orkhon-Selenge river basin in northern Mongolia which belong to the Arctic ocean watershed, see Figure 94.

Figure 94: Mongolian Watersheds



Source: Watersheds of Mongolia, Free C. (2015) Rutgers University[18]

[18] https://marine.rutgers.edu/~cfree/watersheds-of-mongolia/

78. **UB-Darkhan corridor:** The project road crosses Kharaa river at STA.153 nearby Baruunkharaa soum center and passes adjacent to the river all the way up to the Darkhan city in 300-600m distance. Total size of the Kharaa river basin is 14,388 km2. Length of the Kharaa river is 353 km and the slope degree is 0.0040. Water flow for the Kharaa river is around 10.8-11.4 m3/sec. During summer floods that are caused by heavy raining, water table of the rivers increased sharply (by up to 2 meters) within just 1-3 days. As for Kharaa river, average depth of the river is around 100 sm and reaches 130-140 sm during summer floods. The highest flood flow registered for Kharaa river occurred in 1973 when the flow reached 722 m3/sec.

Table 32: Surface Water Bodies Data at Darkhan-Altanbulag Corridor

River	Length km	Basin Size km^2	Flow Rate m^3/sec	Comment
Kharaa river	353 km	14,388 km^2	10.8-11.4	

79. Within 100m of the project road on the left side, Bornuur lake is located (STA.95). The lake is a natural water source which is not known to be used as a drinking water source. Bornuur nuur is shown in Figure 10.

80. The DEIA survey team sampled[19] **water quality** along the road corridor. The DEIA Team note that the results indicate that for a number of parameters in the samples from Kharaa and Hiagt rivers, the maximum allowed level specified in Mongolian standard MNS 4586:1998 (standard for ambient water quality, see Table 33) is exceeded.

Table 33. Kharaa River Water Quality Analysis

Anion	Per Litre			Cathion	Per litre		
	Mg	mg-equivalent	mg-equivalent %		mg	mg-equivalent	mg-equivalent %
Cl-	16.0	0.45	12.51	Na++K+	12.	0.55	15.21
SO4--	5.0	0.10	2.90	Ca++	37.	1.85	51.43
NO2-	0.5	0.01	0.30	Mg++	14.	1.20	33.36
NO3-	2.0	0.03	0.90	NH4+	0.0	0.00	0.00
CO3--	0.0	0.00	0.00	Fe++	0.0	0.00	0.00
HCO3-	183.	3.00	83.40	Fe+++	0.0	0.00	0.00
Дүн	206.	3.60	100.0	Дүн	64.	3.60	100.0

Hardness was 3.05 mg-equi/dm3 an EC was 319 µS/sm.
Source: Eco-Sphere LLC, 2017.

[19] Analysis undertaken at the laboratory of the Geo-ecological institute of Mongolia

81. **Darkhan-Altanbulag corridor.** Within 100m of the project road at 49°38'53.80"N 106° 2'17.96"E, Shariin Tsagaan lake (nuur) is located. The lake is a natural water source which is not known to be used as a drinking water source. It lies approximately 20 km north east of Darkhan city. Shariin Tsagaan nuur is shown in Figure 105. The project road crosses rivers at three locations as shown in Figure 116. The locations are:

(i) Shariin Gol river crossing 49°45'25.16"N 106° 9'59.80"E
(ii) Yeruu river crossing 49°52'43.93"N 106°14'36.52"E
(iii) Orhon river crossing 50°13'21.02"N 106°12'32.47"E

82. Table 34. gives data on the key water bodies in the vicinity of Darkhan-Altanbulag corridor. Orkhon river is approximately 15 km from the project road at Darkhan city and is approximately 9 km from the project road at Orkhon.

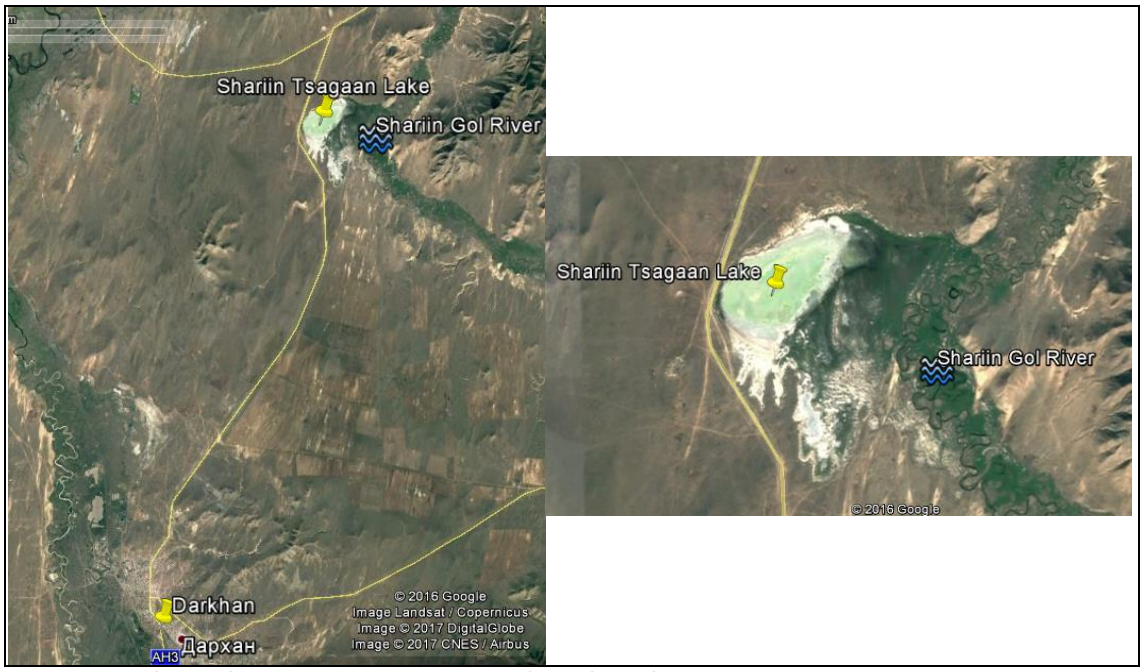
Table 34. Surface Water Bodies Data at Darkhan-Altanbulag corridor

River	Length km	Basin Size km^2	Flow Rate m^3/sec	Comment
Orkhon river	1,149 km	131,635 km^2	-	Tributary to Selenge river
Kharaa river	353 km	14,388 km^2	10.8-11.4	
Yeruu river	388 km	10,896	35.6	Flow rate at Dulaankhan where the road crosses the river
Shariin Gol	162 km	2839.3 km^2	1.65	

Source: Eco-Sphere LLC, 2017

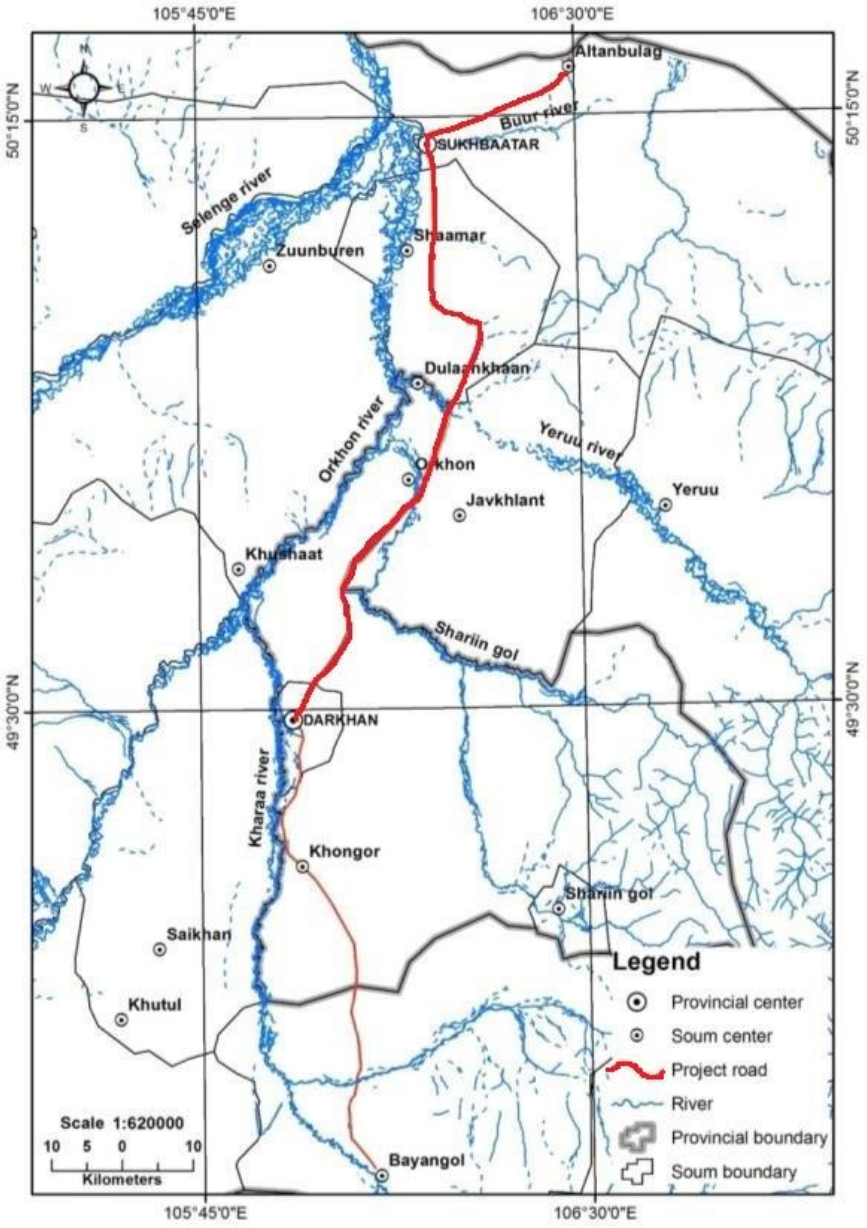
83. **Hydrology and Flooding**. Approximately 56-75% of the total water flow for the rivers in Table 34. is from precipitation. Spring floods are caused by melting of snow cover in mountains occur and generally occur in early April. The spring flood lasts 30-50 days depending on the precipitation level (thickness of snow cover in mountains). Summer floods are caused by heavy rain, which can raise the water table by up to two meters within three days. The highest flood flow registered for Kharaa river occurred in 1973 when the flow reached 722 m3/sec. The highest registered flow for the Yeruu river reached 1290 m3/sec during the 1973 flood period. For Orkhon river, during significant floods, registered flood flow was between 500-1750 m^3/sec.

Figure 105: Shariin Gol Lake Location



Source: Google earth map; ADB PPTA consultant (2017)

Figure 116: Surface Water Bodies at Darkhan-Altanbulag Corridor



Source: Eco-Sphere LLC, 2017

84. The DEIA survey team sampled[20] water quality along the road corridor. The DEIA Team note that the results indicate that for a number of parameters in the samples from Shariin gol, Yeruu and Hiagt rivers, the maximum allowed level specified in Mongolian standard MNS 4586:1998 (standard for ambient water quality, see Table 35 to 37) is

[20] Analysis undertaken at the laboratory of the Geo-ecological institute of Mongolia

exceeded.

Table 35: Shariin Gol Water Quality Analysis

Anion	Per litre			Cathion	Per litre		
	Mg	mg-equivalent	mg-equivalent%		Mg	mg-equivalent	mg-equivalent%
Cl-	14.2	0.40	9.29	Na++K+	34.6	1.51	34.98
SO4--	2.0	0.04	0.97	Ca++	32.1	1.60	37.16
NO2-	0.0	0.00	0.00	Mg++	14.6	1.20	27.87
NO3-	4.0	0.06	1.50	NH4+	0.0	0.00	0.00
CO3--	0.0	0.00	0.00	Fe++	0.0	0.00	0.00
HCO3-	231.8	3.80	88.25	Fe+++	0.0	0.00	0.00
Total	252.0	4.31	100.0	Total	81.3	4.31	100.0

Hardness was 2.80 mg-equi/dm3, EC=414 µS/sm
Source: Eco-Sphere LLC, 2017

Table 36: Yeruu River Water Quality Analysis

Anion	Per litre			Cathion	Per litre		
	Mg	mg-equivalent	mg-equivalent%		Mg	mg-equivalent	mg-equivalent%
Cl-	7.1	0.20	7.87	Na++K+	22.8	0.99	39.01
SO4--	15.0	0.31	12.30	Ca++	21.0	1.05	41.31
NO2-	0.0	0.00	0.00	Mg++	6.1	0.50	19.67
NO3-	8.0	0.13	5.08	NH4+	0.00	0.00	0.00
CO3--	0.0	0.00	0.00	Fe++	0.00	0.00	0.00
HCO3-	115.9	1.90	74.76	Fe+++	0.00	0.00	0.00
Total	146.0	2.54	100.0	Total	49.9	2.54	100.0

Hardness was 1.55 mg-equi/dm3, EC=185 µS/sm
Source: Eco-Sphere LLC, 2017

Table 37: Hiagt River Water Quality Analysis

Anion	Per litre			Cathion	Per litre		
	Mg	mg-equivalent	mg-equivalent%		Mg	mg-equivalent	mg-equivalent%
Cl-	39.1	1.10	15.05	Na++K+	55.4	2.41	32.97
SO4--	15.0	0.31	4.28	Ca++	68.1	3.40	46.51
NO2-	1.5	0.03	0.45	Mg++	18.2	1.50	20.52
NO3-	4.0	0.06	0.88	NH4+	0.0	0.00	0.00
CO3--	0.0	0.00	0.00	Fe++	0.0	0.00	0.00
HCO3-	353.8	5.80	79.35	Fe+++	0.0	0.00	0.00
Total	413.4	7.31	100.0	Total	141.8	7.31	100.0

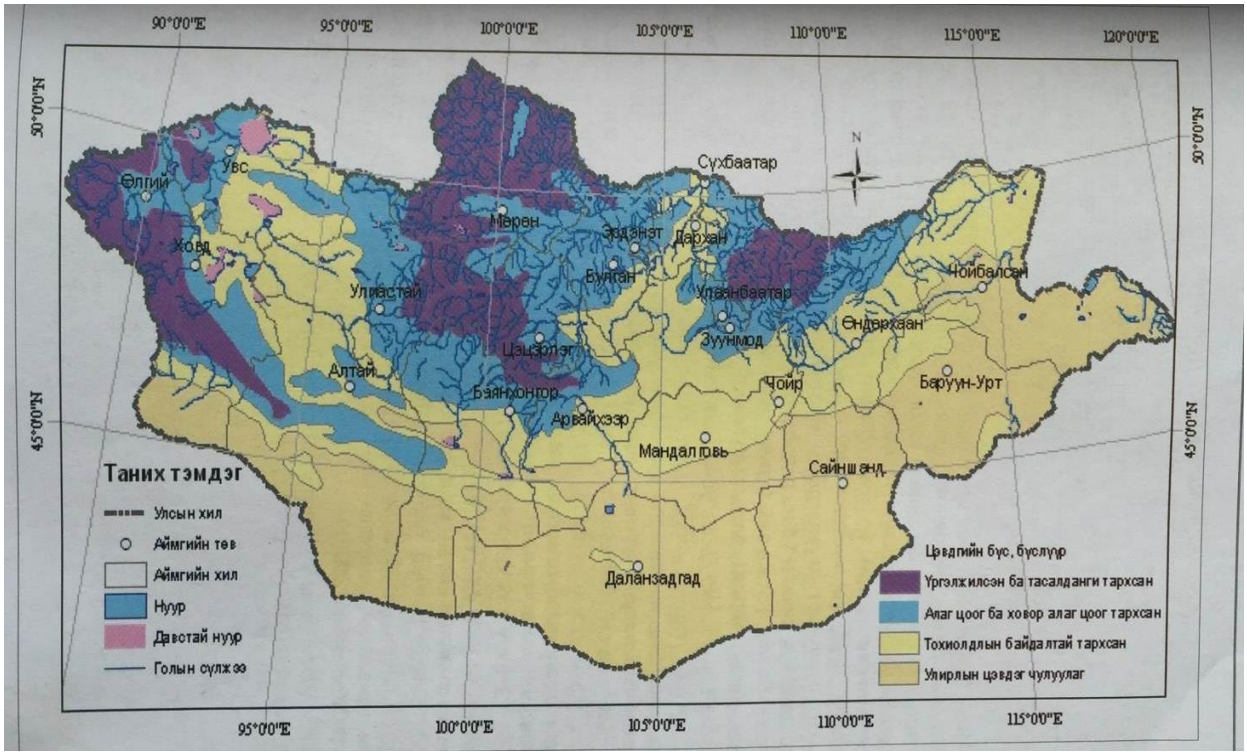
Hardness was 4.90 mg-equi/dm3, EC=722 µS/sm
Source: Eco-Sphere LLC, 2017.

E. Permafrost

85. Mongolia belongs to the South Transition Zone in terms of global permafrost zonation. The zone is characterized by relatively thin permafrost layers and scattered permafrost distribution. Mongolia is further divided into four permafrost sub-zones:

(i) Subzone 1. continuous and non-continuous subzone
(ii) Subzone 2. scattered distribution
(iii) Subzone 3. rare occurrence
(iv) Subzone 4. seasonal frost.

Figure 17. Permafrost zonation map of Mongolia.



Source: G.Davaa, Surface Water Resource and Regime in Mongolia, 2015.

86. The key features of the four subzones are shown in Figure 17, which shows the permafrost zonation in Mongolia. In terms of the project road this means:

(i) Northern section of UB-Darkhan corridor is in subzone No. 3, indicating scattered distribution of permafrost while the southern section in Tuv province belongs to subzone No. 2, indicating that along the majority of the corridor, permafrost is a rare occurrence with potential scattered permafrost spots.

(ii) Darkhan-Altanbulag corridor is in subzone No.3, indicating that permafrost is a rare occurrence.

F. Air Quality

87. Air quality is routinely measured in Mongolia by air quality monitoring stations in the major cities of Ulaanbaatar, Darkhan and Erdenet. For the remainder of the country, no routine monitoring data are available.

88. **UB-Darkhan corridor.** As there is no existing air quality data for the corridor, a field survey team was engaged and measured baseline air quality data on April 17, 2018, focusing on 10 key settlement areas to determine the baseline air quality. Table and figure below show the specific

sample locations for air quality monitoring.

Table 38: Ten air quality monitoring locations along Ulaanbaatar-Darkhan corridor

Locations	Longitude	Latitude	STA	Name of the place	Administration unit
Sample 1	106^0 38’ 23.4”	47^0 54’ 22.2”	STA.03	Emeelt railway station	Songinokhairkhan district
Sample 2	106^0 32’ 36.6”	48^0 00’ 06.4”	STA.39	61st Railway Town	Songinokhairkhan district
Sample 3	106^0 26’ 24.0”	48^0 06’ 38.0”	STA.52	Resort and summer camp area, Tuv province	Tuv province
Sample 4	106^0 27’ 20.0”	48^0 13’ 37.1”	STA.72	Bayanchandman soum center,	Tuv province
Sample 5	106^0 12’ 07.5”	48^0 26’ 43.2”	STA.92	Restaurants on the left side of the road	Tuv province
Sample 6	106^0 10’ 59.0”	48^0 28’ 23.4”	STA.101	Urikhan food center	Tuv province
Sample 7	106^0 04’ 56.9”	48^0 54’ 50.9”	STA.165	Baruunkharaa soum center,	Selenge province
Sample 8	106^0 55’ 39.5”	49^0 18’ 40.2”	STA.190	Khongor soum center	Dakhan-Uul province
Sample 9	105^0 54’ 50.4”	49^0 22’ 35.9”	STA.216	Darkhan city toll gate	Dakhan-Uul province
Sample 10	106^0 11’ 40.0”	48^0 28’ 06.2”	STA.100	“Buugaad mordoy” food center	Tuv province

Emeelt railway station STA.03

Bayanchandmani soum center on the UB-Darkhan road, STA.72

Misha Mart restaurant at STA.92

Figure. 18: Monitoring Locations in the Map

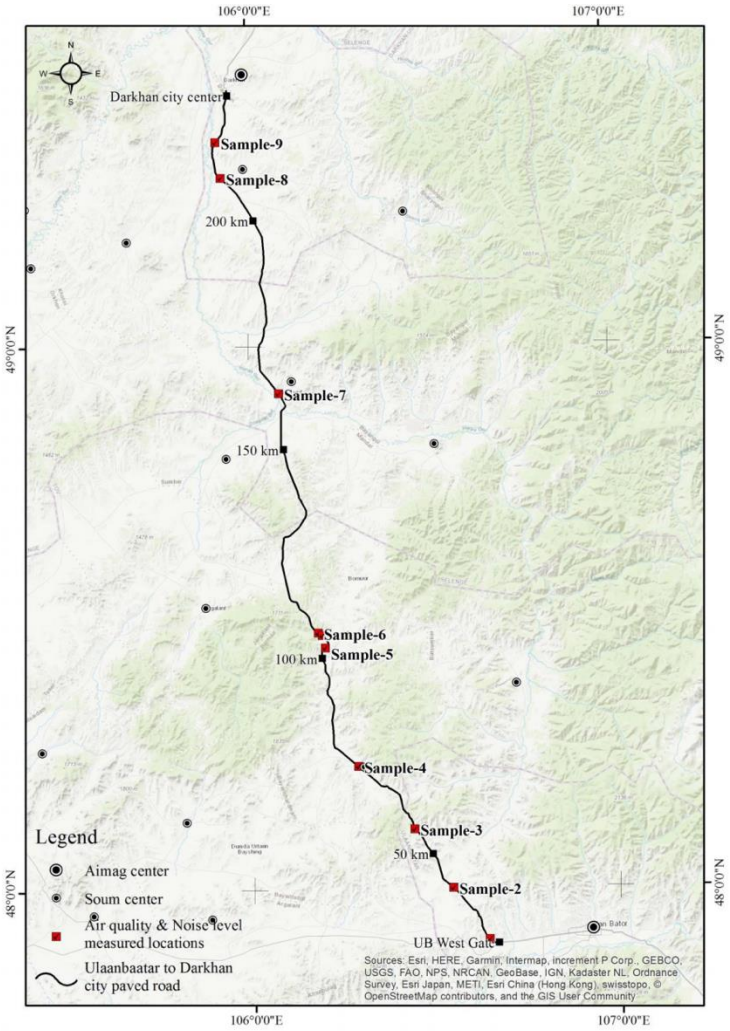
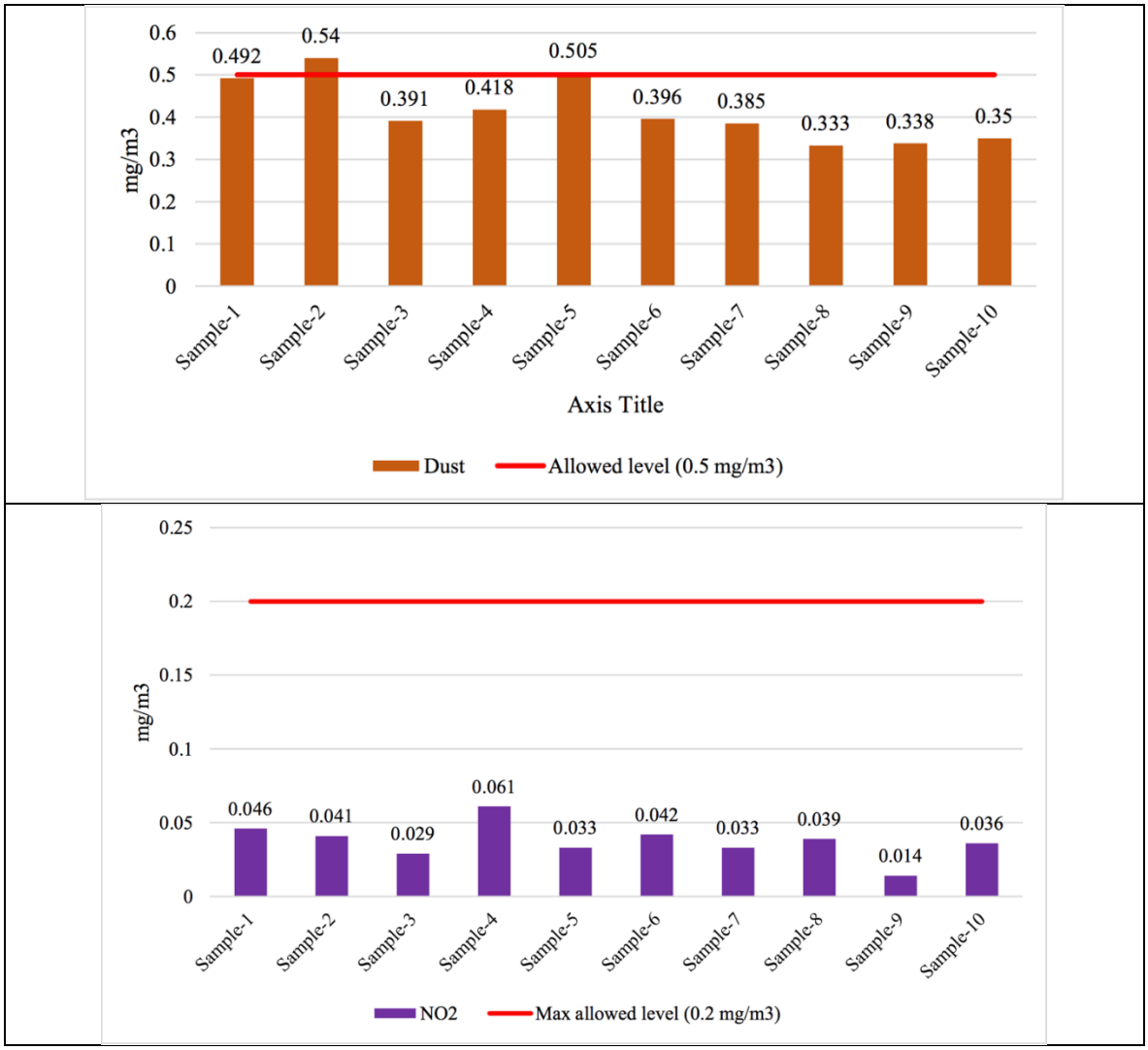
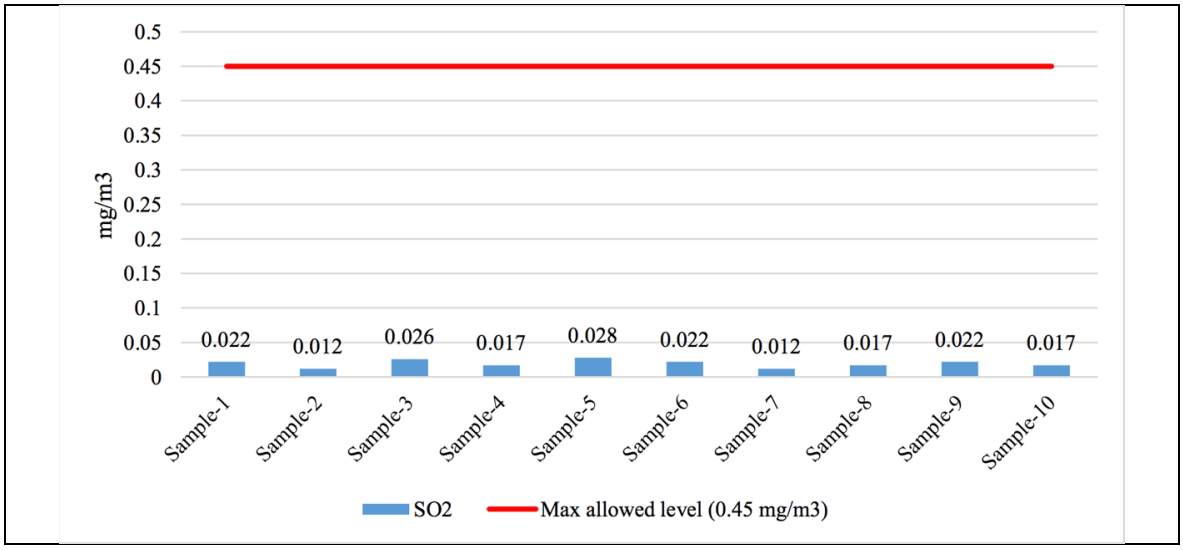


Figure 19: Air quality monitoring results in 10 locations along UB-Darkhan





89. Measured concentration of SO_2 and NO_2 at all locations were much below the maximum allowed levels. However, total suspended particulates (dust level) was higher than the maximum level allowed by the national standard on amibient air quality MNS 4585:2016 at 2 points, namely 61st railway town in Songinokhairkhan district (STA. 72) and Misha retaurant at STA.92.

90. **Air quality data for Darkhan-Altanbulag corridor** provided here is based on the air quality measurements carried out by the licensed EIA firm hired by the ADB commissioned PPTA team in April 2017. Dust measurements undertaken in April are shown in Table 40. The table shows that the maximum measurement of PM 2.5 and PM 10 exceeds the Mongolian national air quality standard, which might be caused by heavy traffic at the time of measurement. The data at UB-Darkhan corridor will be provided during

Table 39: Air Quality Darkhan- Altanbulag Corridor

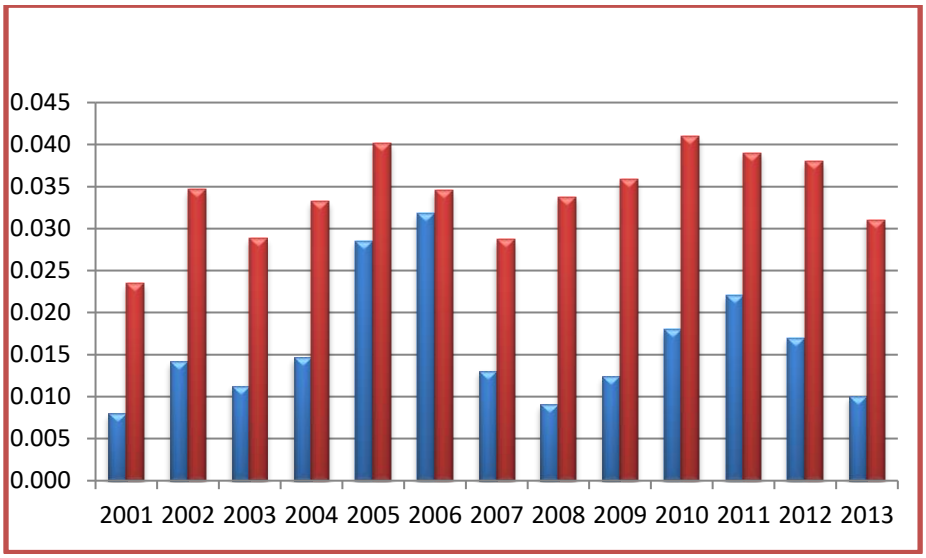
No.	Location & STA	PM 2.5 mg/m³		PM 10 mg/m³	
		Max	Min	Max	Min
1	Darkhan soum STA.226.	0.059	0.007	0.152	0.037
2	STA.232	0.19	0.008	0.217	0.025
3	STA.285+500	0.04	0.02	0.19	0.01
4	STA.276	0.186	0.01	0.19	0.027
5	STA.321, near Sukhbaatar town	0.192	0.018	0.238	0.035
6	STA.345, near Altanbulag town.	0.19	0.01	0.1	0.04
Mongolian Air Quality Standard MNS 4585:2016 (max. 24hr mean)		0.05		0.1	

Note: = exceeds standard

Source: Eco-Sphere LLC, 2017

91. The most comprehensive air quality data for the Darkhan-Altanbulag corridor are found in Darkhan. Air quality is monitored by the Meteorological Institute of Darkhan at an air quality station in Darkhan. Figure 20 shows the last 13 years of measurements for sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) in Darkhan.

Figure 20: Air Quality Data Annual Average, Darkhan, mg/m^3



Note: Red bars indicate NO2 and Blue bars indicate SO2.
Source: Environ LLC. Detailed EIA found in ADB (2014) IEE, Darkhan Wastewater Improvement Project

92. Additional data (Table 40) indicates that air quality met the national air quality standards and meets the WHO standards for 24 hour mean of SO_2 (0.02 mg/m^3) and NO_2 (0.04 mg/m^3) in 2013.

Table 40: SO_2, NO_2, and Dust, Darkhan

Parameter	Sulfur dioxide SO_2	Nitrogen dioxide NO_2	Dust
Average	0.003	0.024	0.053
Mongolian Standard 24 hr Mean	0.020	0.040	0.15
Units	mg/m^3	mg/m^3	mg/m^3

Note: September 2013 data
Source: Meteorological Institute of Darkhan found in ADB (2014) IEE, Darkhan Wastewater Improvement Project

93. The data in Table 40 are for air quality in late summer, which is known to be higher quality than in winter, when the thermal power plant and ger areas of Darkhan emit higher levels of emissions. Therefore the average figures given in Figure are higher, particularly for SO_2, as this includes both winter and summer data; the comparison of these two data sets demonstrates how differences may occur between summer and winter air quality.

G. Noise

94. Noise can affect sensitive receptors such as humans. Mongolian standards on noise are discussed in Chapter II. Given the rural nature of the project corridors, no consistent noise monitoring data was available. Between **Ulaanbaatar-Darkhan corridor** where more settlement areas are involved, a field survey team was engaged and measured baseline noise data on April 17, 2018. According to Mongolian standard, maximum level of day-time noise level is 60 decibels which was exceeded at five locations along the UB-Darkhan road, namely, Emeelt railway station (STA.03), 52 pass, Bayanchandmani soum center (STA.72), Misha restaurant (STA.92) and Urikhan food center (STA.101).

Table 41. Noise monitoring data at 10 locations along Ulaanbaatar-Darkhan corridor

Noise Monitoring Data (dB)	Longitude	Latitude	STA	Name of the place	Administration unit
67	106^0 38’ 23.4”	47^0 54’ 22.2”	STA.03	Emeelt railway station	Songinokhairkhan district
57	106^0 32’ 36.6”	48^0 00’ 06.4”	STA.39	61st Railway Town	Songinokhairkhan district
64	106^0 26’ 24.0”	48^0 06’ 38.0”	STA.52	Resort and summer camp area, Tuv province	Tuv province
64	106^0 27’ 20.0”	48^0 13’ 37.1”	STA.72	Bayanchandman soum center,	Tuv province
62	106^0 12’ 07.5”	48^0 26’ 43.2”	STA.92	Restaurants on the left side of the road	Tuv province
64	106^0 10’ 59.0”	48^0 28’ 23.4”	STA.101	Urikhan food center	Tuv province
50	106^0 04’ 56.9”	48^0 54’ 50.9”	STA.165	Baruunkharaa soum center,	Selenge province
50	106^0 55’ 39.5”	49^0 18’ 40.2”	STA.190	Khongor soum center	Dakhan-Uul province
48	105^0 54’ 50.4”	49^0 22’ 35.9”	STA.216	Darkhan city toll gate	Dakhan-Uul province
52	106^0 11’ 40.0”	48^0 28’ 06.2”	STA.100	“Buugaad mordoy” food center	Tuv province

Maximum standards: 60 dB

Source: ADB PPTA consultant (2018)

95. As for **Darkhan-Altanbulag corridor**, the following noise data were available to determine the baseline condition, which are provided in the table below.

Table 42: Noise Levels Darkhan- Altanbulag Corridor

No.	WGS84 UTM Zone 48 U Coordinates of the measurement locations		Noise *level (dB)	
			Max	Min
1	47°53'56.2"	106°39'37.2"	81.2	73.5
2	48°13'46.1"	106°16'47.9"	79.1	59.6
3	48°53'17.4"	106° 5'59.7"	78.9	61.5
4	49°15'34.6"	105°59'40.2"	80.1	70.2
5	49°29'36.7"	105°56'28.3"	78.3	59.5
6	49°32'25.9"	105°58'52.0"	78.7	66.5
7	49°44'02.7"	106°07'46.0"	76.4	65.1
8	49°44'29.1"	106°08'28.0"	75.4	63.1
9	49°52'31.8"	106°14'25.9"	76.4	45.1
10	49°52'39.5"	106°14'33.6"	74.1	58.3
11	50°13'40.6"	106°12'42.5"	82.0	63.4
12	50°18'09.2"	106°29'16.8"	80.0	77.1
13	50°19'12.9"	106°29'29.7"	83.5	68.1

1hr avearage

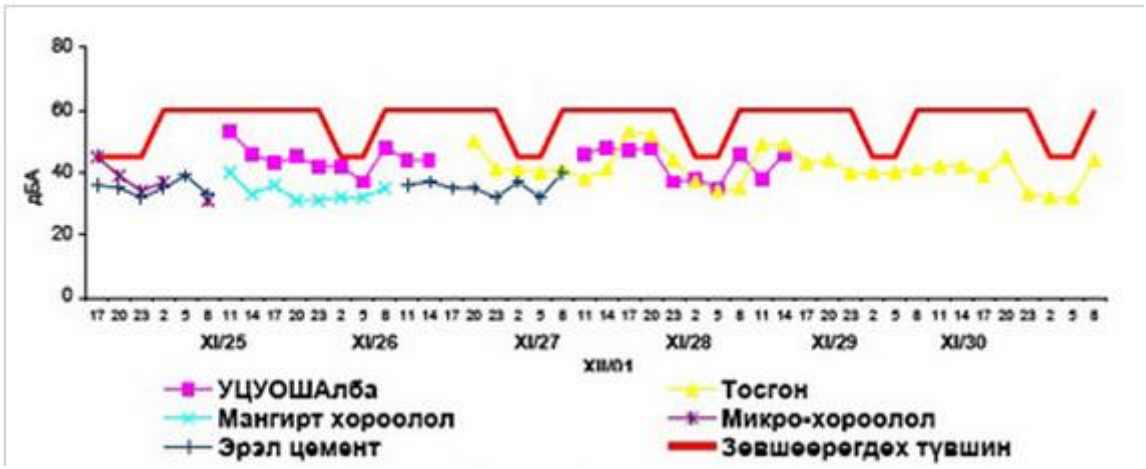
Source: ADB PPTA consultant (2018)

96. Noise data are also available for a specific study undertaken in November 2012 for an assessment of the environmental condition of Darkhan, undertaken by the aimag Meteorological Institute. The data were recorded in five locations and showed that the daytime average was 30-

45 dB (Mongolian National Standard (MNS 4585:2007) is 60 dB) and night time average is 31-43 dB (Mongolian National Standard 45 dB).

97. Figure 21 gives noise monitoring data for five locations in Darkhan.

Figure 21: Darkhan soum Noise Monitoring Data



Key to Locations

Pink - Meteorological Institute, Blue - Mangirt ger district, Black - Erel Cement Factory
Yellow - Tosgon ger district, Purple - Micro district - between Old/New Darkhan
Red line = National Standard

Source: National Committee on Reducing Air Pollution[21]

H. Natural Disasters

98. Mongolia is susceptible to a number of natural disasters. *Zud* conditions mean an extremely cold winter when livestock cannot graze and reach fodder. The condition can be caused by a layer of ice formed after a warm thaw in winter, through a lack of snow in the waterless regions, through too much snow, or by the trampling and pugging of pasture in areas where there is too high a stock density.

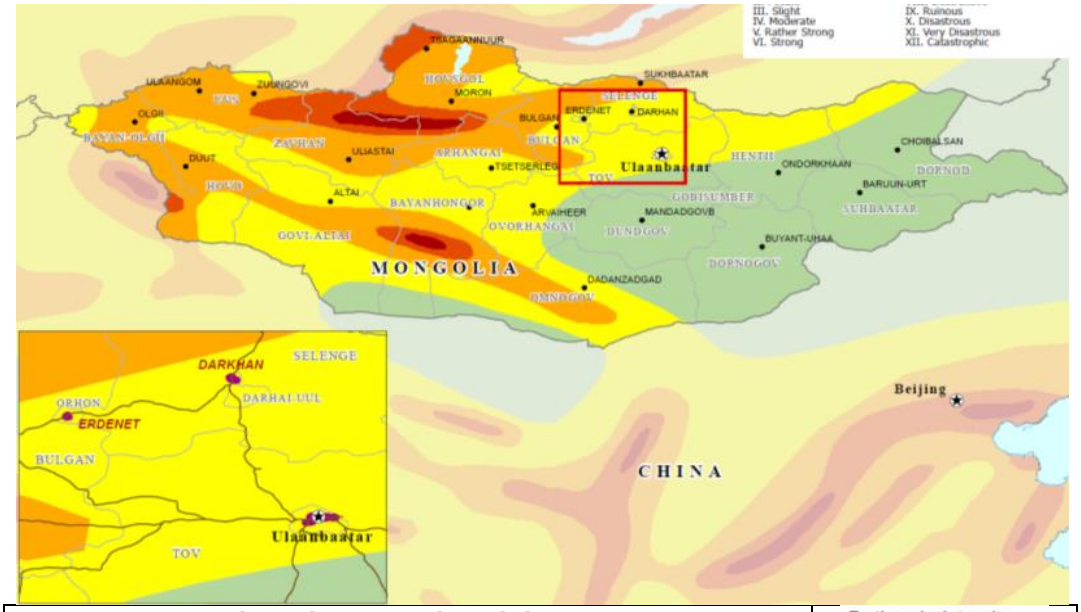
99. **Earthquakes**. Figure22 illustrates seismic hazard in terms of macroseismic intensity[22], using the Modified Mercalli Scale; an alternative hazard metric to the older peak ground acceleration measure. Intensity is a generic bounded damage scale used to relate observed (or expected/forecasted) damage to the earth and built environment directly to earthquake

[21] http://air.president.mn/en/

[22] Intensity may be related directly to peak ground acceleration and peak ground velocity through empirical relationships. The former measure is an international standard hazard metric currently adopted by many countries for presenting national seismic hazard assessments; ground velocity however is often considered a more representative measure of a location's ground motion hazard than ground acceleration. Peak ground velocity is closely related to the energy flux between ground and building. Seismic hazard may be forecast using ground velocity as an alternative measure to intensity, such that intensity may be determined as a function of peak ground velocity. Earthquake damage statistics often give a much closer correlation with peak ground velocity than with peak ground acceleration, particularly at higher intensity values. Both however are more meaningful than using magnitude in isolation when specifying engineering seismic loading design criteria. *Source: Dr J Bayliss, Independent Advisor, UK. Pers. Comm. December 2012*

magnitude. Macroseismic intensity is however a subjective scale, requiring a personal interpretation of damage experienced by buildings after an earthquake, and is, largely based upon post-earthquake field surveys of building and site damage. Figure22? shows UB-Darkhan corridor and southern part of Darkhan- Altanbulag corridor to be in an area of strong earthquake intensity risk (zone VI) while northern end of the Darkhan- Altanbulag Corridor in an area of very strong earthquake intensity risk (zone VII). Yet, the existing UB-Altanbulag corridors do not show any sign of damage from earthquake.

Figure 22: 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

Earthquake Intensity
Modified Mercalli Scale

- Degree I-V
- Degree VI
- Degree VII
- Degree VIII
- Degree IX-XII
- Town
- Province
- Urban Area
- Primary Road

Map Doc Name: MNG_Earthquake Risk_v1_100816
Creation Date: 17 August 2010
Projection/Datum: GCS MONREF 1997
Web Resources: http://ochaonline.un.org/roap

0 250 500
Kilometers

Map data source(s):
Pacific Disaster Center (PDC), Natural Hazard Assessment Network (NATHAN) by the Munich Reinsurance Company, UNEP/GRID, UN Cartographic Section, FAO-GAUL

Disclaimers:
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

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

I. Physical Cultural Resources

100. There are no physical cultural resources present within the project road corridors.

J. Ecological Resources

101. Flora: A vegetation survey was conducted along the road corridor by botanists collecting field data for the DEIA. The team surveyed vegetation at the sites located in Table 43. 74 plant species were registered during the field survey (see Appendix 2A.). No rare plant species were found during the survey.

Table 43. Ecological Survey Locations

Location Number	GPS Co-ordinates	Height (m above sea level)
1	N 49°29´37,4″ E 105°56´28,5″	708
2	N 49°32´25.9″; E 105°58´52.0″	716
3	N 49°44´02.0″; E 106°07´48.1″	689
4	N 49°44´24.1″; E 106°08´08.4″	700
5	N 49°52´39.5″ E 106°14´33.7″	634
6	N 50°13´40.7″ E 106°12´42.1″	608
7	N 50°18´09.5″ E 106°29´15.1″	659
8	N 50°14´43.3″ E 106°18´26.1″	638
9	Start: N 50°12´44,5″ E 106°12´22,4 to End: N 50°13´03,1″ E 106°12´28,4″	602 to 595
10	Start: N 50°00´26.5″ E 106°13´07.0″ to End: N 50°46´41.4″ E 106°13´05.2″	626 to 634
11*	Start: N 50°06´41.4″ E 106°13´05. 2″ To End: N 50°01´34.7″ Ec106°12´54.6″	634 to 704

*Within the pine forest (Pinus sylvestris L.) “Tujiin Nars” nearby Sukhbaatar town
Source: Eco-Sphere LLC, 2017

102. The vegetation comprised trees including pine and larch, and a range of common grasses and flowering plants.

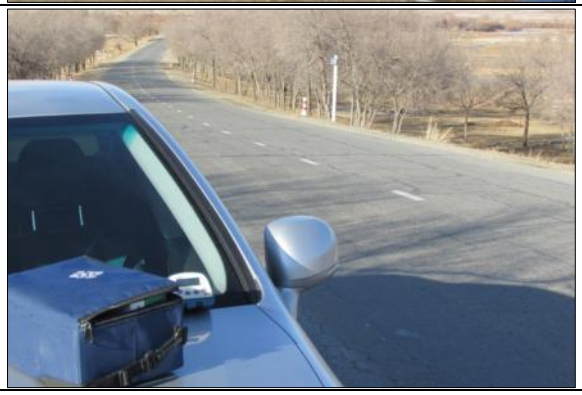
104. Figure 23 shows typical area of pine trees along the corridor (survey location No. 11).

Figure 23: 'Tujiin Nars' pine forest area

Source: ADB PPTA consultants (2018)

105. The DEIA team noted five specific locations where trees encroach onto the right of way, causing potential road safety issues.

Table 44. Locations of Tree Encroachment

Location	Photograph
Darkhan-Altanbulag corridor. Two trees are on the right side of the road at STA.237	
Darkhan-Altanbulag corridor. Stands of trees on both sides of the road between STA.258 and STA.259.	
Darkhan-Altanbulag corridor. There are trees on both sides of the road STA.276, close to Yeruu river bridge (400-500m) N 49^{0}52′50.5″; E 106^{0}14′39.6″	

Darkhan-Altanbulag corridor. Northern and southern parts of the Tujiin Nars pine forest, trees on both sides of the road. Noted as an accident black spot by emergency authorities, From: $50^0 01' 34.7''$; $106^0 12' 54.6''$; To: $50^0 06' 41.4''$; $106^0 13' 05.2'$	
Darkhan-Altanbulag corridor. There are trees close to the road nearby the entrance point of Sukhbaatar town. From: N $50^0 12' 44.5''$; E $106^0 12' 23.4''$; To: N $50^0 12' 28.4''$; E $106^0 13' 03.1''$	

Source: ADB PPTA consultants (2018)

106. The Tujiin Nars forest has protection status of “natural reserve” therefore there is no separate administration for the SPA. Instead, the environmental department of the Selenge province and Sukhbaatar soum administration are responsible for the pine forest.

107. **Fauna**: Of the eight fish species that habitat in the Yeruu, Kharaa and Tuul rivers, one species (*Hucho taimen)* is listed as Vulnerable in IUCN list as well as listed in the rare animal list of Mongolia in 2012. In addition, Lenok or Asiatic trout (*Brachymystax sp*.) is widely distributed across the project area, but listed as vulnerable in the IUCN list and is one of the main target species for illegal fishing.

108. Regarding reptile distribution, the DEIA ecology specialist concludes that given the harsh climate condition with cool, short summers and long period with snow cover, the project region is a favorable habitat for both amphibians and reptiles. None were noted during the survey.

109. Regarding bird life, the DEIA ecology specialist concludes that any bird species are likely to settle further away from disturbance (e.g. construction sites), however, under certain circumstances, they could be affected, for example during breeding periods. It is noted that 29 very rare bird species and 50 rare species are registered in the project region; these species were not noted during the survey.

110. The DEIA contains a wide ranging list of mammal species found in the general area of Mongolia, including rodents and larger mammals such as lynx and bears. However, these are not anticipated to be specifically in the road corridor as their habitats are in the more remote areas of the region; none were identified during the survey.

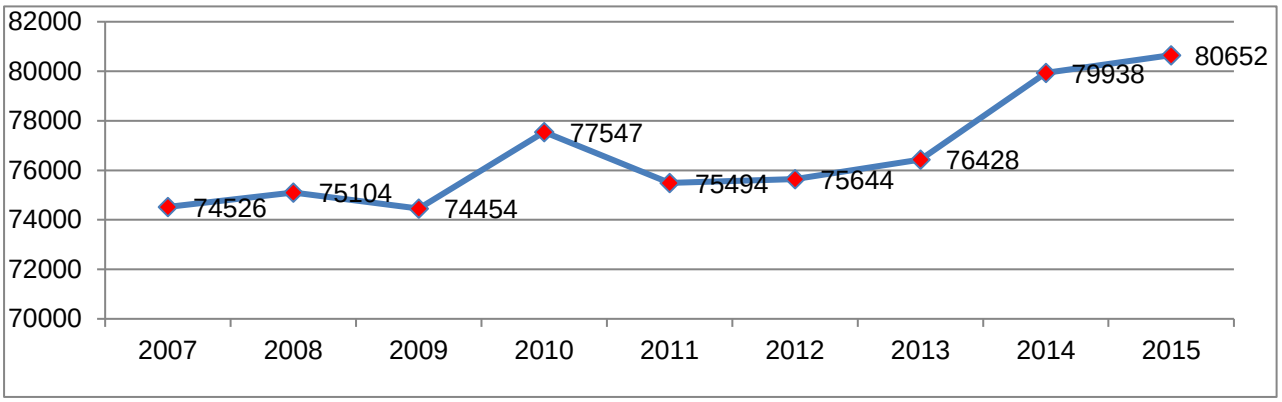
111. Both existing road corridors already have sufficient measures for wildlife and livestock crossings, which do not require additional mitigation measures to protect fauna.

K. Socio-Economic Conditions

112. Darkhan city is the provincial centre of Darkhan-Uul province. Over 80% of the province's population live in Darkhan which has 76,428 permanent residents. The soum has 18 bags and 23,241 households. The population of Darkhan has been steadily rising since a dip in 2011 (Figure 24). Population remained little changed between 2003 and 2009, but following a significant increase in 2010, has shown a decline since then, with a particularly steep decline between 2011 and 2012, and only a slight recovery since then. This suggests that during the period 2003 to 2010 the slow out-migration from Darkhan was being compensated for by the natural population increase[23].

113. Sukhbaatar soum is the provincial city of Selenge province to the north of the corridor. The soum has a population of 24000. The third soum in the corridor is at the project road end point, Altanbulag soum which is located in northern Selenge province. Altanbulag soum has population of 5052 people with the majority of the population being based in the soum centre (81% of households).

Figure 24: Population Change, Darkhan



Source: DEIA draft (2017)

114. **Employment and Poverty**. In Darkhan soum, 30% of the population are under age 18 and the average life expectancy is 69 years. In terms of employment, 69% of the population is considered within the working ages of 15 to 59. Data indicate that Darkhan has 1,485 unemployed people which equates to 2.85% unemployment based on those of working age. In Darkhan, 3806 households are classified as being under the poverty line, which equates to over 16% of all households in the soum.

115. Agriculture is a significant occupation in along the road corridor. The Orkhon-Selenge basin is the biggest crop planting area in Mongolia. 45% of total annual wheat/grain harvest is produced in this area; forestry, flour production, food production, spirit production are the main industrial sectors. Darkhan has an agricultural sector which is based on potatoes, vegetables and livestock which are all found within the area. For livestock Darkhan has approximately 0.8 livestock head per person, and Altanbulag has in excess of seven.

[23] Mongolia Human Development Report 2011: From Vulnerability to Sustainability, UNDP, Ulaanbaatar, 2011

116. In addition, Darkhan has an increasing industrial zone. Darkhan was established as an industrial city in the 1960s and it continues to be an industrial town. In 2009, manufacturing and mining employed approximately 19,000 people, which is approximately 16% of the aimag population[24.]

117. **Social infrastructure.** The central hospital of the Darkhan city has capacity to receive 352 inpatients and in addition there are a further ten 'household' hospitals, and a further 25 private owned hospitals or clinics. Altanbulag and Sukhbaatar also have central hospitals. For education, Darkhan is an educational center within the project corridor. It has ten tertiary educational institutions in addition to 25 secondary schools and 14 kindergartens, and a number of other small vocational training centers. The transient student population during term-time is estimated to peak at about 5,000.[25]

118. **Connectivity**. Darkhan soum has a well developed infrastructure. The Ulaanbaataar-Altanbulag sealed and rail roads pass through Darkhan and Sukhbaatar and the cities are connected to the central energy distribution system of Mongolia and fiber optic cable networks.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Environmental Impact Screening

119. The following discussion on environmental impacts screens the potential impacts according to the following factors and recommends mitigating activities on this basis:

(i) **"Receptor"**: the resource (human/natural environment/economic/social) which is potentially going to receive and have to cope with an impact.

(ii) **"Sensitivity"**: ability to cope with an impact and/or its importance to the country of Mongolia. It is generally accepted that human health is always a high sensitivity receptor, however in terms of environmental/natural resources, the sensitivity varies according to the receptor e.g. scrubland with no significant biodiversity is considered less sensitive than a mature forest which supports ecosystems and livelihoods.

(iii) **"Magnitude"**: the size of the potential impact. Impacts may be short term and considered low magnitude (e.g. noise or temporary reduction of income during a short construction project) or high magnitude (e.g. the poor disposal of large quantities of hazardous waste into a water course).

120. Where an impact may occur, if there is no receptor on which is potentially going to receive the impact, then mitigating actions will not be required. This follows the source-pathway-receptor model, whereby in order for there to be an impact, the pollutant or issue (source) needs to be present, the pathway to a receptor is needed (such as fissures in rocks, or water for human consumption) and a receptor must be present to receive the impact, such as humans, flora or fauna.

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[24] Sigel K. (2010) Environmental sanitation in peri-urban ger areas in the city of Darkhan (Mongolia): A description of current status, practices, and perceptions

[25] ADB. IEE Darkhan Wastewater Management Improvement Project, Nov. 2014

B. Impacts Associated with Project Location, Planning and Design

121. **Measures and Actions during detailed design and pre-construction.** The mitigation of impacts from these design issues includes the following measures:

(i) **Institutional set up and strengthening.** Recruitment of (a) appointment of a qualified Environmental Officer within the PIU by the IA; and (b) contracting of a Loan Implementation Environmental Consultant (LIEC) will be carried out. Prior to the start of construction, the institutional strengthening and training program will be delivered by the LIEC. The training will focus on ADB's and PRC's relevant environmental, health and safety laws, regulations and policies; implementation of the EMP, environmental monitoring, and the GRM. Training will be provided to the PIU, and contractors.

(ii) **Grievance Redress Mechanism**. In accordance with the GRM (see Chapter VIII and Appendix 1), the PIU Environmental Officer will assume overall responsibility for the GRM. The PIU will issue public notices to inform the public within the project area of the GRM, and contact information (GRM website address, PIU address and telephone number, PIU contact point email address) and local entry points (e.g. contractors).

(iii) **Updating the EMP (if required):** Mitigation measures defined in this EMP and the EMoP will be updated based on final technical design. This will be the responsibility of the PIU Environmental Officer and the LIEC. Submit to ADB/PIU for approval and disclose updated EMP on project and ADB website.

(iv) **EMP in bidding document.** The project specific EMP will be incorporated in the bid documents and construction contracts

(v) **Disclosure and Consultation**: Information disclosure and consultation activities will be continued with affected people and other interested stakeholders, including but not limited to the project implementation schedule, GRM and status of compensation (if relevant).

C. Environmental Impact and Mitigation Measures during Construction

122. **Air Quality.** Moderate temporary air quality impacts during the construction stage of the project are anticipated because of fugitive dust generation along road sections and construction-related activities such as asphalt plants. Minor increases in the level of nitrogen oxides (NO_x) and sulfur oxides (SO_x) from construction machinery are expected. Air quality impacts during construction are likely to result from the following sources:

(i) Emissions from construction machinery and equipment, movement of haulage trucks;

(ii) Asphalt concrete paving will produce fumes containing small quantities of toxic and hazardous chemicals such as volatile organic compounds and poly-aromatic hydrocarbons;

(iii) Fugitive dust from borrow pits; and

(iv) Fugitive dust from loading, unloading and haulage of construction materials.

123. The mitigation measures to protect sensitive receptors from air quality issues are:

(i) Asphalt batching facilities will be located at least 500m downwind from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions.

(ii) Water will be sprayed for construction sites, material handling areas, and borrow pits where fugitive dust is generated.
(iii) Trucks carrying stone chippings for surface dressing will be covered with tarpaulins or other suitable cover.
(iv) Construction vehicles and machinery will be maintained to a high standard to minimize emissions.
(v) Good construction management practices will be implemented to control construction dust.

124. **Soil erosion**. Constructing climbing lanes will involve earthwork. It will involve excavation of existing shoulder areas, and reconstructing adequate foundation for road embankment. It might also involve borrow pits depending on available soil around climbing lanes. According to the PPTA team, borrow areas will be in small scale. During detailed engineering design stage, the volume and specific locations will be determined for borrow areas.

125. Potential impacts on soil erosion will be mitigated through the following measures.

(i) Site specific borrow management plan will be developed and approved by relevant soum authority.
(ii) A map of all borrow sites will be developed and maintained;
(iii) Safety measures, if required, will be implemented to prevent access by members of the public and livestock;
(iv) Measures for control of dust during extraction, handling and transport of materials; and
(v) Measures to rehabilitate the borrow sites include contouring of the slopes within each site and reseeding sites with native species.

126. **Solid waste management.** Waste management is managed through the effective implementation of the Waste Management Plan, which the contractor is required to prepare before construction starts. Solid Waste Management Plan for the management of all construction wastes associated with the project including hazardous wastes may include:

(i) The waste hierarchy to ensure efficient use and management of resources will be applied so that priority is to prevent waste at source as much as possible.
(ii) Effective management of materials on site through good house-keeping and work planning will be carried out.
(iii) Detail arrangements for storage and transportation of the waste to its disposal point will be made.
(iv) Hazardous waste, if any, will be handled and transported, and further disposed by a specialized agency with proper license.
(v) Closely coordinate and obtain agreements with relevant aimag or soum authorities for waste management, including transportation and disposal of wastes. Ensure any contractors used to transport waste are approved by aimag authorities.
(vi) Prohibit burning of waste at all times.
(vii) Provide all vehicles/drivers with plastic bags for waste collection and prevent any unauthorized waste disposal.

127. **Noise**. Road routine maintenance works do not involve heavy noise vehicles. The major noise source will be excavation and reconstructing embankment for climbing lanes, which involves high noise construction machinery and vehicles. It is expected to produce noise levels

up to 90 dB(A) within 5m of the machinery as shown in Table which indicates noise levels for construction machinery. For the project, no receptors other than construction workers will be this close to the machinery, and construction workers will use appropriate personal protective equipment (PPE).

Table 44: Construction Machinery Noise

Machine Type	Distance to Machinery									
	5 m	10 m	20 m	40 m	60 m	80 m	100 m	150 m	200 m	300 m
Loader	90	84	78	72	68.5	66	64	60.5	58	54.5
Vibratory Road Roller	86	80	74	68	64.5	62	60	56.5	54	50.5
Bulldozer	86	80	74	68	64.5	62	60	56.5	54	50.5
Land Scraper	90	84	78	72	68.5	66	64	60.5	58	54.5
Excavator	84	78	72	66	62.5	60	58	54.5	52	48.8
Roller	87	81	75	69	65.5	63	61	57.5	55	51.5

Source: Government of Mongolia. 2011.

128. The major works will be carried out during the daytime. The noise produced during construction will have an impact on the existing ambient noise levels but the elevated noise levels will be temporary and localized.

129. The potential noise impacts will be mitigated through a number of activities:

(i) Maintain all exhaust systems in good working order; undertake regular equipment maintenance;
(ii) Restrict construction activities using heavy machinery work between 9am-6pm where the climbing lane is constructed nearby residential areas in Darkhan, to avoid any unnecessary disturbances;
(iii) Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the Grievance Redress Mechanism will be disseminated.
(iv) Ensure noise monitoring is undertaken near sensitive receptors, particularly dwellings when construction machinery is operational.

130. **Flora.** Impacts on flora will be mainly near borrow areas. Due to absence of road maintenance work, some trees and shrubs have been overgrown within the road right-of-way and drainage areas along the road corridor passing Tujin Nars pine forest (from N 50°06´41.4˝ E 106°13´05. 2, to N 50°01´34.7˝E 106°12´54.6˝). Five specific locations were identified where trees encroach onto the road. These trees and shrubs need to be removed for road safety and proper drainage.

131. The impacts on pasture land induced by borrow areas will be mitigated by minimize the scale of borrow areas as much as possible and restoration measures immediately after construction is completed. Tree relocation from the existing road right-of-way and road drainage area and relocating them with aftercare will be arranged and carried out in accordance with an approval from and through close coordination and supervision from Environment Department of

the Selenge province and Sukhbaatar soum administration. The plan will be in accordance with Mongolia's Forest Law if required.

132. **Surface and Groundwater**. In Darkhan-Altanbulag corridor, the existing roads have several river crossings including Shariin Gol river crossing 49°45'25.16"N 106° 9'59.80"E, Yeruu river crossing 49°52'43.93"N 106°14'36.52"E and Orhon river crossing 50°13'21.02"N 106°12'32.47"E. In addition, there is Shariin Tsagaan Nuur lake 150m from the existing road in the north of Darkhan (49°38'53.80"N 106° 2'17.96"E) the existing road in the north of Darkhan.

133. To mitigate any potential impacts on surface and ground water, good construction management and practices will be carried out to ensure construction works do not encroach on the surface water. Demarcation with high visibility tape and signs will be installed at river crossings and Shariin Tsagaan Nuur to warn contractors of the need for vigilance in these areas. Upon discussion and agreement with the local authorities, water protection zones for Sharin Tsagaan Nuur Lake might be established to protect surface water quality of the lake.

134. **Occupational Health and Safety.** To avoid any accident and mitigate any potential impacts on workers' health and safety, the following mitigation measures will be carried out:

(i) Train and ensure all construction workers to be aware of potential work hazards and risks.
(ii) Provide PPE, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers.
(iii) Document and record any occupational accidents and incidents. Review the records and incorporate them into further training.
(iv) An emergency response plan will be developed and implemented to take actions on accidents and emergencies, including; Worker injury (e.g. construction or traffic accident); Spillage (e.g. fuel spillage); Fire (e.g. fuel storage area or asphalt batching); Dust storm; and any other incidents anticipated by the contractor. Emergency phone contacts with hospitals in the nearest *soum* or *aimag* will be established. A first-aid point will be established at each construction site.

135. **Community Health and Safety**. Potential impacts may arise from road safety issues and health and safety of the public around construction activities. These can be mitigated as follows:

(i) Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, or hazardous materials.
(ii) All sites will be made secure through access control by installing fences and/or security personnel, whenever appropriate.
(iii) In addition, through informing soum authorities, communities will be made aware of the road maintenance and clear sign boards will be visible providing GRM details.
(iv) borrow pits will be managed to ensure unauthorized or accidental access to the sites by the public and livestock.

136. **Cultural Heritage**. Nearby the existing road corridors, there are several cultural sites identified: the tomb at Bayan Hutual, 100m from the road in Darkhan-Altanbulag corridor. To mitigate any impacts on these cultural heritage sites, the following mitigation measures will be implemented though consultation with the Archaeological Institute of Mongolia and coordinate

with relevant soum, and demarcate the tomb at Bayan Hutual with high visibility tape and a sign

D. Environmental Impact and Mitigation Measures Post Construction

137. Due to the nature of the project, which is to improve safety on the existing project road corridors as well as improve the road quality, no additional negative impacts are anticipated which result from the project. As the road will be continuously in operational with function improvement, usual impacts associated with road are noise, traffic safety, greenhouse gas (GHG) emissions and air pollution. Instead there will be a positive community health and safety benefit, through improved road safety, particularly at traffic black spots with relative high incidents of traffic accidents.

138. **Cumulative Impacts**. Given the intermittent nature of the project in a very rural location, no local cumulative impacts are anticipated. As with all construction projects, it will contribute to cumulative global impacts from emissions of GHG associated primarily with transportation and the use of materials.

VI. INFORMATION DISCLOSURE AND PUBLIC CONSULTATIONS

A. Public Consultations during Project Preparation

139. During project preparation, meetings were held with stakeholders to obtain views and opinions on the project. This information was also incorporated in the DEIA and satisfy the national requirements for consultation during EIA preparation.

140. **Public Consultation for Darkhan-Altanbulag corridor.** The DEIA consultant team conducted community consultation meetings along the road corridor from 30 March 2017 and 2 April 2017. The community consultation included meetings with local soum administration staff at Sukhbaatar and Altanbulag soum and carried out a questionnaire based survey among roadside communities and residents of major settlement areas along the road corridor

141. A total of 85 local residents who include soum administration staff, soum center residents and herders participated in the survey. The participants are categorized as follows in Table 25.

Table 25: Survey Participants

Category	Participants
Gender	59% male and 41% female
Occupations	65% state entities 12% private owned entities, 5% crop planting business (farmers) 18% ‘other’ employment
Education	58% University education 7% specialized technical education 27% high school education 8% have primary and middle school education

142. The questionnaire-based survey included seven questions; the answers for each question are summarized in Table 45.

Table 45: Survey Responses

Question	Response
1. How much do you know about the routine minor rehabilitation works previously conducted for the Darkhan-Altanbulag road?	35% have very good knowledge/awareness 45% know to some extent 20% have no knowledge/awareness
2. Would you support if a major road rehabilitation work is conducted for the Darkhan-Altanbulag road	95% replied they will support it 5% said will not
3. What environmental impacts might arise from road rehabilitation and what are your main concerns?	10% impacts on land use such as shrinkage of grazing land 7% pollution of water resources 20% land damage and soil erosion 36% dust emission 9% deterioration of plant cover 10% disturbance on wildlife movement and habitat 8% impacts on forest resources
4. Did any natural disasters (such as heavy snow fall, flood and earthquake) occurred in the place you live in the last 10 years?	23% Yes (dzud) 77% No
5. What are the main positive and negative outcomes of the road rehabilitation work for the Darkhan-Altanbulag road?	Positive outcomes; 14% said increase of job opportunities 6% said improvement of livelihood 5% said increase of state budget income 9% said increase of local budget income 17% said improved infrastructure 16% said it helps to the development of local economy and society. Negative outcomes: 4% said it will lead to pasture degradation 3% said water resource will be reduced 7% said pollution and erosion to soil cover 6% said air pollution 3% said degradation of plant cover 10% said there are no negative impacts
6. What mitigation measures could be in place during the rehabilitation of the Darkhan-Altanbulag road?	Regular minor routine repairs Improvement of signs and livestock crossing points Install speed bumps at necessary points Widening of the road if possible When planting trees on two sides of the road, make sure a proper distance is kept between the trees and the embankment, otherwise trees will grow onto the road. Make sure planted trees are protected properly
7. Do you have any other suggestions regarding the usage and maintenance of the road?	The road shall be cleaned of snow cover and dust regularly The road maintenance entity needs to be provided with snow cleaning truck Prohibit heavy duty trucks with capacity of over 40 tons driving the road

Question	Response
	To carry out a survey on places and points where dangerous natural phenomenon occurs Pay special attention to STA.226 in Darkhan soum where there is no signage, thus accidents occur frequently.

143. In addition to the public consultation, a series of meetings were held with government officials on 31 March and 1 April 2017.

(i) Meeting with T.Gantulga – Governor of Sukhbaatar soum of Selenge province. The soum governor will fully support the road rehabilitation works. When the Sukhbaatar soum residents travel to UB city, the road goes through Darkhan city. The road between UB and Darkhan is poor quality and broken at several points. Thus, the local governor would like to see the UB-Darkhan road rehabilitated too.

(ii) Another meeting was held on 31 March 2017 with B.Batzorig – Head of Environmental Department of Selenge Provincial Government, who expressed that the provincial government will support the road rehabilitation. However, there are a few points of concern once the rehabilitation is completed. In particular, some local construction companies do not dispose of construction waste materials such as removed asphalt layers, spoil and gravel into the unpermitted locations such as drainage channels. Local environmental staff shall visit construction sites to conduct inspections during the handover period. However, he said that these bad practices are not related to any ADB financed projects, but wanted to note the points to ensure that future road rehabilitation is conducted in a good manner.

(iii) Meeting with Tsengelzaya – Head of Forest Department of Selenge Provincial Government. D.Baasanbat and R.Delgerdalai – State Emergency Officers in Selenge province. They commented that it would be good if trees are planted on both sides of the road. At some points along the road (in Tujiin Nars – a pine forest nearby Sukhbaatar town) trees were planted or have grown too close the embankment which affects visibility for drivers thus may lead to car accidents. Future EMP for the rehabilitation work shall include this measure.

(iv) Meeting with D.Unursaihan – Deputy Governor of Altanbulag soum, Selenge province, who stated that the soum administration will support the road rehabilitation. No specific comments and suggestions.

144. **Additional Public Consultation for UB-Darkhan-Altanbulag road corridor.** An additional public opinion survey was carried out on March 2018. A total of 120 herder households who reside along the road corridor were participated in the survey. A project preparation consultant for the project visited all the herder households and carried the survey through face to face discussion, interviews and filling up the questionnaire. The main survey questions were focusing on baseline livelihood conditions and their concern on livelihood and environmental conditions.

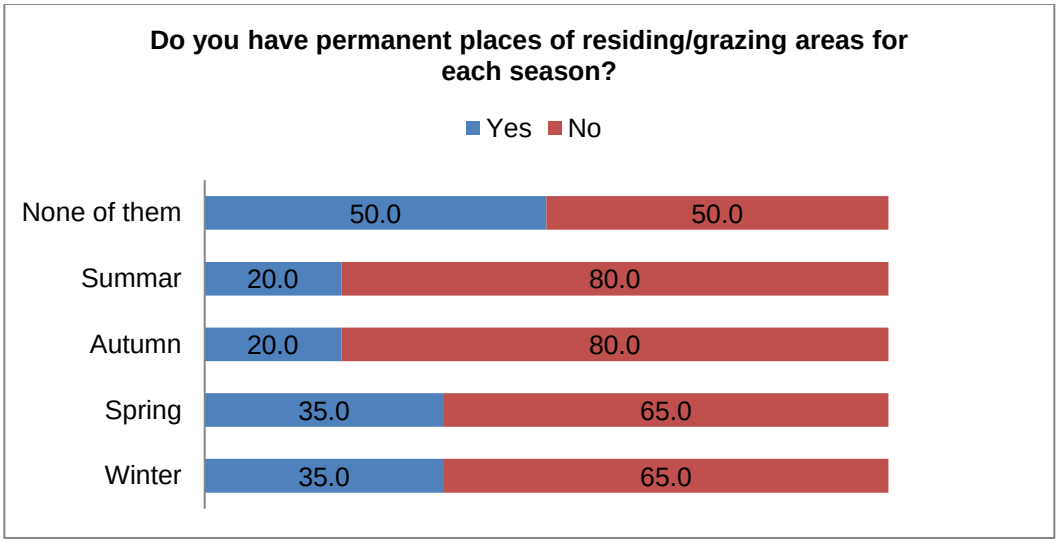
Table 46: Survey participants by province of residence

Soum, Provinces	# of households participated in the survey	% in the total number of participants
Darkhan and Khongor soums at Darkhan-Uul province	109	90.8%
Bayanchandmani soum at Tuv province	3	2.5%

Soum, Provinces	# of households participated in the survey	% in the total number of participants
Bayangol soum at Selenge province	8	6.7%
Total	120	100.0%

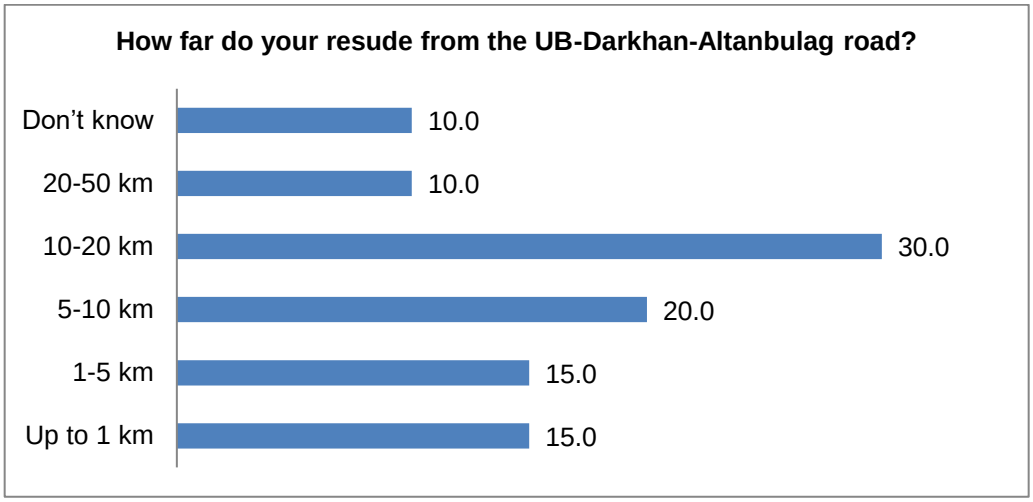
Source: ADB PPTA consultant (2018)

145. A total of 35% survey participants responded that they have permanent places of residing/grazing areas only during the winter and spring seasons, while 20% responded they have permanent places/grazing areas only during the autumn and summer seasons. About a half of the participants responded that they do not have permanent places of residing which means the places they reside changes every year.



Source: ADB PPTA consultants (2018)

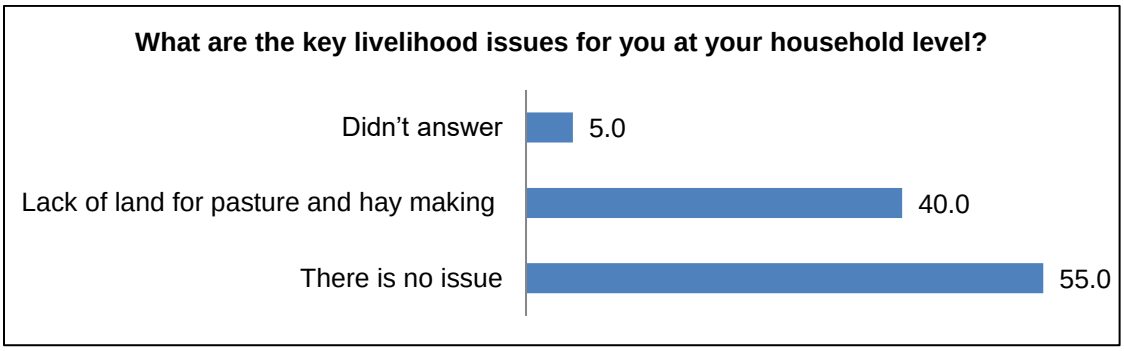
146. A total of 50% survey participants reside within 10 km distance from the project road corridor, while 40% reside within 10-50km distance.



Source: ADB PPTA consultants (2018)

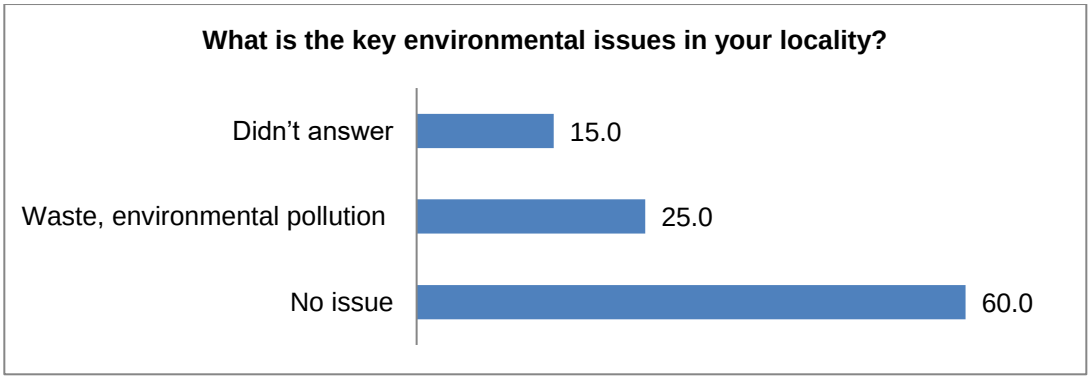
147. Regarding the questions on drinking water sources, the survey result shows that no household is constantly relying on nearby rivers as their drinking water source. However, 30% of herder households are using river water for drinking purposes only sometimes. A total 25% of the participants responded they have their own water well, while 75% responded they don't have own water well.

148. For the question on key livelihood issues, 55% responded that there is no livelihood issues for them, while 40% responded that the key issue is they do not have adequate pastureland and fodder preparation fields.



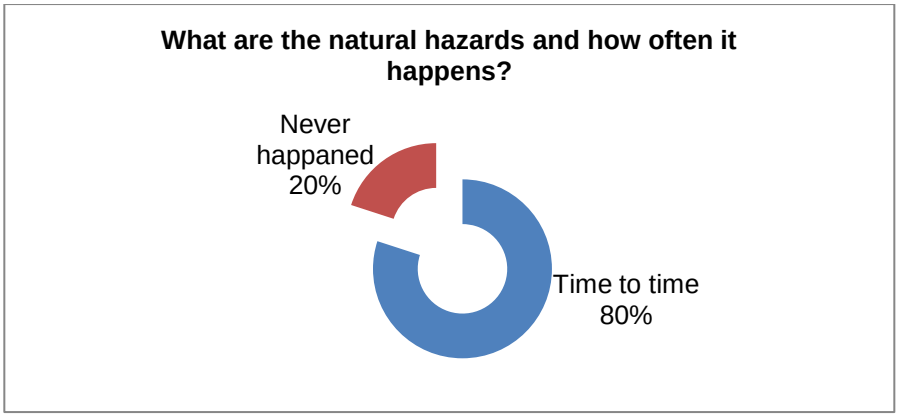
Source: ADB PPTA consultants (2018)

149. Responding to **the question on key local environmental issues,** 60% of the participants responded that there is no environmental issues in their localities, while 25% responded that the key concern is increasing waste disposal and environmental pollution.



Source: ADB PPTA consultants (2018)

150. In terms of key natural disaster and associated frequency level, 80% responded that zud disaster (heavy snow falling) happens in their places of living, while 20% responded there is no natural disaster like zud happen in their places of living. A total of 45% herder households have experienced zud disaster last year.



Source: ADB PPTA consultants (2018)

151. Summary: A total of 50% survey participants do not have a permanent living place or grazing lands. About a half of the respondents reside within 10km distance from the UB-Darkhan-Altanbulag road. Most of the herder households do not rely on river water as their main drinking water source while only 25% of the herders have their own water wells. As for key livelihood concerns, 40% of the participants do not have adequate pastureland while 25% responded that environmental pollution and increasing waste disposal is the key environmental issues in their places of living. No environmental impacts relevant to the project was raised during the survey and the respondents were supportive on the road maintenance project.

B. Public Consultations during Project Implementation

152. During implementation, the PIU will undertake consultation interviews a minimum of twice along each project corridor. It is proposed that this takes places within 6-8 weeks of construction starting and then again before the end of construction. This is set out in the Environmental Monitoring Plan.

153. Informal interviews with affected people will focus on complaints about community disturbance from construction activities, such as construction noise, dust, solid waste and wastewater, as well as public concerns about ecological protection, soil / land concerns and access issues, including accessibility problem induced by heavy snow. A sample Environmental Monitoring Interview Form is given in Appendix 1.

C. Information Disclosure

154. Environmental information on the project, including the IEE and other safeguards information will be disclosed in accordance with ADB's Public Communications Policy (2011) and SPS (2009). This includes:

(i) The IEE will be available for review in MRTD's office;
(ii) The IEE will be disclosed on ADB's project website (www.adb.org);
(iii) Copies of the IEE are available upon request; and
(iv) Annual reports on project's compliance with the Environmental Management Plan (EMP) and other necessary information will be available at www.adb.org.

VII. GRIEVANCE REDRESS MECHANISM

A. GRM Objective

155. A grievance redress mechanism (GRM), consistent with the requirements of the ADB Safeguard Policy Statement (2009) will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. In addition to serving as a platform to resolve grievances, the GRM has been designed to help achieve the following objectives: (i) open channels for effective communication, including the identification of new environmental issues of concern arising from the project; (ii) demonstrate concerns about community members and their environmental well-being; and (iii) prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations. The GRM is accessible to all members of the community.

1. Proposed Grievance Redress System

156. The proposed GRM follows the existing approach taken for managing complaints about local issues by members of the public in Mongolia. Residents' complaints or concerns are generally taken to *bagh* or *soum* representatives for resolution, therefore this system is proposed for the GRM. The GRM approach also fits with the *aimag's* existing approach to managing complaints for the public, which is focused on taking complaints to soums.

157. The PIU will establish *soum* based Public Complaints Unit (PCU) in conjunction with local government representatives and the PIU Environment Officer will take a focal point of GRM.

158. The PIU environmental officer (EO) will closely communicate with soum-based PCUs on the work schedule, so that residents will be informed and can get information about the project or can discuss any concern or issue related to the project. The PCUs through PIU will issue public notices to inform the public within the project area of the Grievance Redress Mechanism. The PCU's phone number, fax, address, email address will be disseminated to the people through displays at the respective offices of the *bagh*, *soum* and *aimag* government administrations and public places.

159. The PIU EO will have facilities to maintain a complaints recording system (such as database or complaints log book) and communicate with LIEC, contractors, design and construction supervision company(s), Governors of *aimags, soums,* and *baghs.*

2. GRM Steps and Timeframe

160. Procedures and timeframes for the grievance redress process are as follows and shown in **Error! Reference source not found.**.

(i) **Stage 1: Access to GRM.** If a concern arises, the AP may resolve the issue of concern directly with the contractor (during construction) The contractor shall resolve the issue by taking corrective actions within seven working days upon identification of the eligibility of the complaint. The contractor shall report to the bagh or soum level PCU and PIU. For an oral complaint the PCU must make a written record. For each complaint, the PCU will report to the PIU EO, who will assess its eligibility. If the complaint is not eligible, e.g. related to an issue outside the scope of the project, PCU will provide a clear reply within five working days to

the AP. If the complaint is eligible but resolved by the contractor, the PIU and PCU will investigate and resolve the issue within 14 working days.

(ii) **Stage 2: Stakeholder Meeting:** If no solution can be identified by the PIU and PCU or if the AP is not satisfied with the suggested solution under Stage 3, within 14 days, the PCU together with the PIU will organize a multi-stakeholder meeting under the auspices of the head or the representative from the *soum Governor office*, where all relevant stakeholders will be invited. The meeting should result in a solution acceptable to all, and identify responsibilities and an action plan. The agreed redress solution needs to be implemented within seven working days.

(iii) **Stage 3: Special consultation meeting with the EA, ADB, and relevant authorities, including Aimag Specialized Inspection Agency (ASIA)**[26]**.** If the Multi-stakeholder meeting cannot resolve the problem, and the AP is unsatisfied, the PIU will inform the EA and ADB and reorganize a special consultation meeting within 21 days with the AP, the EA, ADB, and other relevant authorities including ASIA to find appropriate solutions. The agreed solution shall be implemented within 14 days reporting. The PCU must report all kinds of complaints to PIU, who is responsible to record the complaint, investigation, and subsequent actions and results and provide this information to the PIU-Environmental Monitoring Specialist who will include it in progress reports. In the construction period and the initial operational period covered by loan covenants the EA will periodically report complaints and their resolution to ADB in the semi-annual environmental monitoring reports.

VIII. CONCLUSIONS

A. Major Environmental Impacts and Mitigation Measures

161. The principal impacts during the design phase are associated with the planned removal of trees, particularly from the pine forest area along the Darkhan-Altanbulag corridor, where trees encroach into the right of way and reduce traffic safety. During the construction phase, there will be impacts in both corridors are associated with the noise and dust consistent with construction projects of this type, and the associated health and safety risks for contractors undertaking the work. In addition, for both corridors, there is a potential impact on the grassland used for pasture along both sides of the project corridors, when haul routes or deviations and borrow sites or quarries are required by the contractor.

162. Impacts are anticipated during operation include noise, traffic safety, GHD emissions and air pollution, which are already occuring as the road already existed for long period and has been fully operational. Instead, the traffic safety works associated with this project outputs are anticipated to bring benefits to the communities along the project corridor and all other road users. Continuous good road maintenance service should be maintained to ensure good road accessibility and traffic safety to be carried out as intended.

163. The mitigation measures set out in the EMP for the project will manage the impacts during pre-construction and construction. The mitigation measures implemented in the pre-construction phase will promote the elimination of impacts associated with the surface water, groundwater

[26] A specific division within the organization is responsible for Infrastructure, Environment and Mining inspection.

and cultural heritage receptors in the project area through breaking the source-pathway-receptor links; the pathway will be removed. For the remaining impacts which cannot be avoided, the mitigation measures seek to minimize them to acceptable levels.

164. In addition a robust programme of monitoring is established by the EMP and regular reporting will be required. Through monitoring and reporting any deviation from the EMP or unanticipated impacts can be dealt with by PIU environment officer. Also the Grievance Redress Mechanism will be in place and managed by the PIU in order to appropriately handle any complaints arising from project activities.

B. Overall Conclusion

165. The findings of this IEE show that the environmental impacts associated with this project's outputs to be localized, short term and are not considered significant. Through implementing the mitigation measures set out in the IEE, the project proponents will mitigate any impacts to an acceptable level.

APPENDIX 1. ENVIRONMENTAL MANAGEMENT PLAN

A. Objectives

1. The environmental management plan (EMP) in line with ADB's SPS 2009, covers all phases of implementation from preparation to operation. It aims to ensure the monitoring of environmental impacts and activation of environmental mitigation measures. Relevant parts of the EMP will be incorporated into the construction, operation, and management of each output.

B. Implementing Organizations and Their Responsibilities

2. The key organisations responsible for implementing the project and the role in Environmental Safeguards implementation are set out in Table 1.

Table 1: Implementing Organizations

General Role & Responsibilities	Role in Environmental Safeguards
Ministry of Road Transport Development (MRTD)	
• Executing agency (EA) • Establishes and chairs a Project Steering Committee (PSC) • Establishes a Project Implementation Unit (PIU)	Overall responsibility for ensuring environmental safeguard are implemented
Project Steering Committee (PSC)	
• Chaired by Director General, MRTD • Provides project oversight • Includes representatives of the MRTD, Ministry of Finance	Support and specific advice to EA on specific safeguard issues if needed
Project Implementation Unit (PIU)	

• Implementing Agency (IA) • Reports to EA • Project implementation and supervision • Preparing and submission of implementation reports to ADB • PIU staff to include part-time Environmental Monitoring Consultant	1. Ensure Bidding Documents and Contracts include EMP and any relevant Particular Clauses or Conditions relevant to Environmental Safeguards as set out in this IEE. 2. Implementing and supervising EMP and other safeguard plans 3. Provision of safeguard reports to EA 4. Provision of specialist consultant to perform the function of PIU Environmental Officer 5. Dissemination & Implementation of Grievance Redress Mechanism (GRM)
PIU Environmental Officer (PIU EO)	
• EMP implementation, including monitoring and reporting	1. Ensure tender documents specify requirements of EMP 2. Ensure that EMP considerations are incorporated in the detailed designs and included in civil works contracts 3. Training for contractor/engineers in implementing EMPs 4. Site inspections and progress reporting. EMP update after detail project design 5. Input into GRM 6. Conducting consultation meetings with local stakeholders as required, informing them of imminent construction works, updating them on the latest project development activities, GRM (see Appendix 2 for Environmental Monitoring Interview Form sample)
Project Management Consultant (PMC)-Loan Implementation Environment Consultant (LIEC)	

• Implementation and capacity development consultancy support to PIU	Support safeguard issues as required Support PIU in preparing EMRs
Design and Construction Supervision Company(ies)	
• Design of the maintenance in sections • Construction supervision	Collaboration with PIU-EMS on final designs to ensure acceptable mitigation of environmental impacts
Construction Companies	
• Completion of road sections as specified • Provision of Environmental Control Engineer	1. Environmental Control Engineer responsible for daily monitoring and supervision, and evaluation of mitigation measures' implementation 2. Develop and implement construction site specific EMP (CEMP). 3. Reporting on CEMP mitigation measure implementation

CEMP = construction site specific EMP, EMP = environmental management plan, EMR = environmental monitoring report, GRM = Grievance Redress Mechanism, PIU = project implementation unit, PIU-EMS = Environmental Monitoring Specialist.

3. **Institutional Strengthening and Capacity Development**. In order to strengthen the capacity of the EA and IA, the project includes Output 3, related to capacity development in project supervision and implementation, including standard project supervision. This also includes training in maintenance, procurement and safeguards, and piloting of new technologies, and environmental safeguards and environmental management is also recommended. Table below show training program to enhance environmental safeguards and environmental management of the project.

Table 2: Training Program

Training	Attendees	Contents	Times	Period (days)	No. of persons	Cost ($/person /day)	Total Cost
Construction Phase							
ADB, Mongolia and	PIU, contractors	– ADB's safeguard	Twice-	1	20	100	$2,000

Training	Attendees	Contents	Times	Period (days)	No. of persons	Cost ($/person /day)	Total Cost
International EHS standards, regulations and policies, including GRM		policy statement – International environmental, health and safety management practice in civil construction – International environmental, health and safety management practice in civil construction – GRM structure, responsibilities, and timeframe Types of grievances and eligibility assessment	once prior to, and once after one year of project implementation				
Implementation of EMP and EMoP, including construction EHS plans	PIU, IA, contractors	– Impacts and mitigation measures – Monitoring and auditing mechanism – Reporting requirements – Issue of non-compliance and corrective	Twice - once prior to, and once after one year of project implementation	1	20	100	$2,000

Training	Attendees	Contents	Times	Period (days)	No. of persons	Cost ($/person /day)	Total Cost
		actions for EMP, EMoP and GRM.					
						Total estimated cost:	**$4,000**

Notes:,EHS=Environment, Health and Safety, EMP = Environmental management plan, EMoP=Environmental Monitoring Plan, GRM=Grievance redress mechanism, PIU = Project implementation unit.

C. Mitigation Measures

4. Table 3 presents the mitigation measures, costs and responsibilities for each relevant environmental impact as determined by the screening process. Included in the mitigation measures is the institution responsible for implementing and overseeing each.

D. Monitoring

5. The contractors and design and construction supervision company will be required to conduct proper EMP performance monitoring. The PIU Environment Officer will conduct regular site visits and EMP performance monitoring with support from the LIEC so to assess effectiveness of EMP implementation. Depending on construction schedule, receptors in the vicinity (such as nomadic herders who may come into and out of construction areas) and potential impact levels, the frequency and scale of EMP performance monitoring will be adjusted by the PIU Environment Officer.

6. T

7. Table 4 presents the monitoring plan. It is targeted at monitoring the key receptors as set out in the baseline survey. The receptors are: (i) Humans (impacted on by noise and dust); and (ii) Flora (impacted on by tree removal and potential haul roads). If there is any, additional monitoring requirements of an approved DEIA under Mongolian law will be incorporated into the monitoring plan, which may need the update of the monitoring plan.

8. Table presents the monitoring program estimated budget based on current costs in Mongolia. These represent likely maximum costs for one year however not all analysis is required each year as it is dependent on the location of the road sections under construction sites. Environmental monitoring activity for a given month shall only be conducted at locations that lie within active construction areas that month. The construction season lasts 6 months in Mongolia, between April and October; the EMP will be monitored monthly. The monitoring parameters and frequency will be aligned with the DEIA requirements. This EMP and EMoP will be updated after the DEIA approval and also during detailed design and the precise locations and frequency of monitoring will be established.

Table 26: Mitigation Measures

Environmental Impact/Issue	Area of concern	Mitigation measures	Timeframe and frequency	Cost ($)	Implemented by	Supervised by
Pre-Construction Phase						
Environmental Management System		• Institutional set up and strengthening. Recruitment of (a) appointment of a qualified Environmental Officer within the PIU by the IA; and (b) contracting of a Loan Implementation Environmental Consultant (LIEC) will be carried out. Prior to the start of construction, the institutional strengthening and training program will be delivered by the LIEC. The training will focus on ADB's and PRC's relevant environmental, health and safety laws, regulations and policies; implementation of the EMP, environmental monitoring, and the GRM. Training will be provided to the PIU, and contractors. • Grievance Redress Mechanism. In accordance with the GRM (see Chapter VIII and Appendix I), the PIU Environmental Officer will assume overall responsibility for the GRM. The PIU will issue public notices to inform the public within the project area of the GRM, and contact information (GRM website address, PIU address and telephone number, PIU contact point email address) and local entry points (e.g. contractors). • Updating the EMP (if required): Mitigation measures defined in this EMP and the EMoP will be updated based on final technical design. This will be the responsibility of the PIU Environmental Officer and the LIEC. Submit to ADB/PIU for approval and disclose updated EMP on project and ADB website. • EMP in bidding document. The project specific EMP will be incorporated in the bid documents and construction contracts • Disclosure and Consultation: Information disclosure and consultation activities will be continued with affected people and other interested stakeholders, including but not limited to the project implementation schedule, GRM and status of compensation (if relevant).	Before construction	Included in operational costs	PIU/Contractor /DCSC	PIU

Construction Phase						
Air Quality – Dust & Vehicle Emissions	Construction sites, borrow pits and stockpiling areas	• Good construction management practices will be implemented to control construction dust Water will be sprayed for construction sites, material handling areas, and borrow pits where fugitive dust is generated. • Water will be sprayed for construction sites, material handling areas, and borrow pits where fugitive dust is generated.	Continuously during construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC
	Both Outputs: Asphalt batching facilities	• Asphalt batching facilities will be located at least 500m downwind from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions.	Continuously during construction	Included in operational costs	Contractor	PIU EO, LIEC
	Construction vehicles and trucks	• Construction vehicles and machinery will be maintained to a high standard to minimize emissions. • Trucks carrying stone chippings for surface dressing will be covered with tarpaulins or other suitable cover.	Continuously during construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC
Soil erosion	Borrow areas	• Site specific borrow management plan will be developed and approved by relevant soum authority. • A map of all borrow sites will be developed and maintained; • Safety measures, if required, will be implemented to prevent access by members of the public and livestock; • Measures for control of dust during extraction, handling and transport of materials; and • Measures to rehabilitate the borrow sites include contouring of the slopes within each site and reseeding sites with native species.	Continuous during borrow areas management and end of construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC

Solid waste management	Construction sites, construction camps, and construction vehicle/driver' waste	• The waste hierarchy to ensure efficient use and management of resources will be applied so that priority is to prevent waste at source as much as possible. • Effective management of materials on site through good house-keeping and work planning will be carried out. • Detail arrangements for storage and transportation of the waste to its disposal point will be made. • Hazardous waste, if any, will be handled and transported, and further disposed by a specialized agency with proper license. • Closely coordinate and obtain agreements with relevant aimag or soum authorities for waste management, including transportation and disposal of wastes. Ensure any contractors used to transport waste are approved by aimag authorities. • Prohibit burning of waste at all times. • Provide all vehicles/drivers with plastic bags for waste collection and prevent any unauthorized waste disposal.	Continuous during construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC
Noise	Both Outputs: All construction sites	• Maintain all exhaust systems in good working order; undertake regular equipment maintenance; • Restrict construction activities using heavy machinery work between 9am-6pm where the climbing lane is constructed nearby residential areas in Darkhan, to avoid any unnecessary disturbances; • Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the Grievance Redress Mechanism will be disseminated. • Ensure noise monitoring is undertaken near sensitive receptors, particularly dwellings when construction machinery is operational.	Continuous during construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC
Flora	Impacts on pasture land induced by borrow areas	• Minimize the scale of borrow areas as much as possible • Restoration measures immediately after construction is completed.	During construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC
	Trees and shrubs encroached to road right-of-way	• Tree relocation from the existing road right-of-way and road drainage area and relocating them with aftercare will be arranged and carried out in accordance with an approval from and through close coordination and supervision from Environment Department of the Selenge province and Sukhbaatar soum administration. The plan will be in accordance with Mongolia's Forest Law if required	During construction	Included in operational costs	Contractor/DC SC	PIU EO, LIEC, Selenge Aimag Env. Department

Surface and ground water Protection	UB-Altanbulag corridor	• Good construction management and practices will be carried out to ensure construction works do not encroach on the surface water. • Demarcation with high visibility tape and signs will be installed at river crossings and Shariin Tsagaan Nuur to warn contractors of the need for vigilance in these areas.	Beginning of construction period and during construction	Included in Contractor operational costs	Contractor/DC SC	PIU EO, LIEC,
Occupational Health and Safety.	All construction sites	• Train and ensure all construction workers to be aware of potential work hazards and risks. • Provide personal protection equipment (PPE), such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers. • Document and record any occupational accidents and incidents. Review the records and incorporate them into further training. • An emergency response plan will be developed and implemented to take actions on accidents and emergencies, including; Worker injury (e.g. construction or traffic accident); Spillage (e.g. fuel spillage); Fire (e.g. fuel storage area or asphalt batching); Dust storm; and any other incidents anticipated by the contractor. Emergency phone contacts with hospitals in the nearest soum or aimag will be established. A first-aid point will be established at each construction site.	Throughout construction	Included in Contractor operational costs	Contractor/DC SC	PIU EO, LIEC,
Community Health and Safety	Settlements near all construction sites	• Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, or hazardous materials. • All sites will be made secure through access control by installing fences and/or security personnel, whenever appropriate. • In addition, through informing soum authorities, communities will be made aware of the road maintenance and clear sign boards will be visible providing GRM details. • borrow pits will be managed to ensure unauthorized or accidental access to the sites by the public and livestock.	Throughout construction	Included in Contractor operational costs	Contractor/DC SC	PIU EO, LIEC,

Cultural Heritage	the tomb at Bayan Hutual, 100m from the road in Darkhan-Altanbulag corridor.	• Demarcate the Ovoo with high visibility tape and a sign through close coordination with Bayantal soum • Consult with the Archaeological Institute of Mongolia and coordinate with relevant soum, and demarcate the tomb at Bayan Hutual with high visibility tape and a sign	Beginning of construction period	Included in Contractor operational costs	Contractor/DCSC	PIU EO, LIEC, Soum authorities
Operation Phase- continuous good road maintenance service should be maintained to ensure good road accessibility and traffic safety to be carried out as intended.						

Note: DCSC=Design and construction supervision company, LIEC=Loan implementation environment consultant, PIU EO=Project Implementation Unit Environment Officer.
Source: ADB PPTA team (2017)

Table 4: EMP Monitoring (pls see acronyms list)

Monitoring parameters	Units	Frequency	Indicative Location	Scope of work	Corresponding standards	Maximum allowed level
Dust level-TSP, PM10	mg/m^3	Quarterly during construction season	Six locations for each road corridor •At receptors within 100m of active construction work and borrow sites, contractors camp (if required). Receptors include housing areas, nomadic herder sites (if relevant) and businesses	Carry out dust measurements at the selected monitoring spots using 'Dust Trak' on monthly basis.	MNS17.2.3.16-88 MNS3384-82 MNS4585-2016 MNS 5885:2008 MNS 3384-1982	Dust<150 mg/m^3
Noise level	dBA (1hr LAeq)	Quarterly during construction season	Climbing lane construction sites •At receptors within 50m of active construction work. Receptors include housing areas, nomadic herder sites (if relevant) and businesses.	Carry out noise measurements at the selected monitoring spots on monthly basis.	MNS5002:2008 MNS 0012-9-015-87	1hr LAeq 60dBA
EMP Mitigation Measures	EMR Monthly during construction		At locations as indicated in the EMP Mitigation Measures table	PIU-EO will be responsible for monitoring the mitigation measures through field visits and reporting.		

EMP = environmental management plan, EMR = environmental monitoring report, m = meter, PIU EO=Project Implementation Unit Environment Officer, PM = particulate matter

Table 5: Monitoring Budget

Monitoring parameters	Cost ($ USD) –Per Year
Dust level-TSP, PM10	**UB-Darkhan** $100x6 x 6 = $3,600 **Darkhan-Altanbulag** $100x2 x 6 = $3,600
Noise level	**UB-Darkhan** $100x 6 x6 = $3600 **Darkhan-Altanbulag** $100x 6 x6 = $3600
Tree relcoation & pasture replanting	**UB-Darkhan** $1000 **Darkhan-Altanbulag** $5000

Monitoring parameters	Cost ($ USD) –Per Year
Health and Safety	**UB-Darkhan** $5000 **Darkhan-Altanbulag** $5000
EMP performance monitoring	PIU budget cost for PIU-EMS
Total Costs	$30,400

E. Reporting

9. Regular reporting on the implementation of mitigation measures and on monitoring activities during construction phase of the component is required. Reporting is the responsibility of IA and EA. Environmental monitoring reports (using ADB's integrated safeguards monitoring report format) will be prepared quarterly by the IA/EA in collaboration with PMU-EMS and sent to MET and ADB. Table 6 provides reporting requirements.

Table 27: Reporting Requirements

Report	Frequency	Purpose	From	To
Contractor's Progress Report	Monthly	EMP Implementation Progress	Contractor	PIU
EMP Monitoring	Quarterly	EMP monitoring parameters	Design and construction supervision company	PIU
Environmental Monitoring Report	Annual	Full EMP Implementation and Adherence to Environmental Covenants/Conditions	PIU/EA	ADB/MET
Environmental completion Report (with attachment of copies of relevant environmental inspection reports and copies of environmental acceptance issued by government)	Three months after construction completion	Final evaluation and assessment of EMP implementation	PIU/EA	ADB

ADB = Asian Development Bank, EA = executing agency, EMP = environmental management plan, MET = Ministry of Environment and Tourism PIU = Project Implementation Unit.

F. Mechanisms for Feedback and Adjustment

10. Once the DEIA is approved, the PIU with support of the LIEC will assess the need of EMP revision. After consultation and endorsement from ADB, EMP will be revised to reflect additional

requirements from the approved DEIA, if any.

11. Based on environmental monitoring and reporting systems in place, the PIU shall assess whether further mitigation measures are required as corrective action, or improvement in environmental management practices are required. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. The PIU Enviroment Officer, with suport from the LIEC will play a critical role in the feedback and adjustment mechanism. If the PIU identifies a substantial deviation from the EMP, or if any changes are made to the project scope that may cause significant adverse environmental impacts or increase the number of affected people, then the PIU shall immediately consult MET and ADB to get approval and identify EMP adjustment requirements.

APPENDIX 2a. FLORA SURVEY RESULTS

Species recorded during field survey, Darkhan-Altanbulag corridor

No.	Plant family	Scientific name of plant species	English name of plant species
1	Pinaceae Lindl.	*Pinus sylvestris L.*	Scots pine
2		*Pinus sibirica* Du Tour.	Siberian pine
3		*Larix sibirica* Ldb.	Siberian larch
4	Ulmaceae Mirb.	*Ulmus pumila L.*	Siberian elm
5	Ephedraceae Dumort.	*Ephedra sinica* Stapf.	Ephedra
6	Graminaeae Juss.	*Stipa krylovii*Roshev.	Spear-grass
7		*Stipa sibirica* (L.)Lam.	Needlegrass
8		*Stipa baicalensis* Roshev.	Green needle grass
9		*Cleistogenes squarrosa (*Roshev.) Ohwi.	Longearistata
10		*Koeleria macrantha* (Ldb.) Schult.	Schillergras/kammschmiele
11		*Poa attenuata* Trin.	Meadow-grass
12		*Poa pratensis* L.	Smooth meadow-grass
13		*Festuca lenensis* Drob.	Fescue
14		*Achnathrum splendens*	Punagrass
15		*Agropyron cristatum* (L.)P.B.	Wheat-grass
16		*Hordium brevisubulatum* (Trin.) Link.	Barley
17		*Elymus chinensis* (Trin.) Keng.	Lyme-grass
18		*Elytrigia repens (L.) Desv.*	Quackgrass
19		*Bromis inermis*	Smooth brome-grass
20	Cyperaceae Juss.	*Carex duriuscula* C.A.Mey.	Needleleaf sedge
21	Liliaceae Juss.	*Allium senescens* L.	German garlic
22		*Allium anisopodium* Ldb.	Thread-leaf chive
23		*Allium bidentatum* Fisch.ex Prokh.	Asian onion
24	Urticaceae Juss.	*Urtica cannabina L.*	Nettle
25	Polygonaceae Juss.	*Polygonum angustifolium* Pall.	Knotgrass
26	Chenopodiaceae Vent.	*Chenopodium album* L.	Goosefoot
27		*Salsola collina* Pall.	Saltwort
28		*Kochia prostrata* (L.) Schrad.	Summer cypress
29		*Corispermum mongolicum*	Tick-seed
30	Caryophyllaceae Juss.	*Stellaria dichotoma* L.	Starwort
31		*Arenaria capillaris* Poir.	Slender mountain sandwort
32		*Dianthus versicolor* Fisch.	Pink
33	Ranunculaceae Juss.	*Pulsatilla turczaninovii* Kryl.et.Serg.	Pasque-flower
34		*Thalictrum simplex*L	Meadow-rue
35		*Thalictrum foetidum L.*	Foetid meadow-rue
36		*Halerpestes ruthenica (Jacq.) Ovcz*	
37	Cruciferae Juss.	*Ptilotrichum tenuifolium*(Steph.) C.A.Mey.	Alyssum trichostachyum

38		*Dontostemon integrifolius* (L.) C.A.Mey.	Dentastamen
39	Rosaceae Juss.	*Potentilla bifurca* L.	Cinquefoil
40		*Potentilla acaulis L.*	Cinquefoil
41		*Potentilla tanacetifolia*	
42		*Sibbaldianthe adpressa* (Bge.) Juz.	Pea-shrub
43	Leguminosae Juss.	*Caragana microphylla* (Pall.) Lam.	Caragana
44		*Caragana stenophylla Pojark.*	Caragana versicolor
45		*Caragana pygmaea* (L.)DC.	Caragana pumila
46		*Astragalus galactites* Pall.	Milk vetch
47		*Astragalus mongolicus Bunge.*	Milk- vetch Mongol
48		*Oxytropis filiformis DC.*	Oxytropis
49		*Thermopsis dahurica Czefr.*	Thermopsis
50	Linaceae S.F.Gray	*Linium sibiricum DC.*	Flax
51	Umbelliferae Juss.	*Bupleurum scorzonerifolium*Willd.	Thorough-wax
52		*Bupleurum bicaule Helm.*	Thorough-grow
53	Primulaceae Vent.	*Androsace incana Lam.*	Rock-jasmine
54	Plumbaginaceae Juss.	*Goniolimon speciosum* (L.) Boiss.	Beauty Goniolmon
55	Convolvulaceae Juss.	*Convolvulus arvensis L.*	Cornbind
56	Boraginaceae Juss.	*Lappula intermedia* (Ldb.) M.Pop.	Stick-seed
57	Labiatae Juss.	*Thymus gobicus*Tschern.	Thyme
58		*Phlomis tuberosa L.*	Jerusalem-sage
59	Scrophulariaceae Juss.	*Veronica incana* L.	Silver speedwell
60		*Cymbaria dahurica* L.	
61	Plantaginaceae Juss.	*Plantago major* L.	Plantain
62	Rubiaceae Juss.	*Galium verum* L.	Bedstraw
63	Compositae Giseke.	*Heteropapus hispidus*(Thunbg.) Less.	Aster
64		*Artemisia dracunculus* L.	Estragon
65		*Artemisia pectinata* Pall.	Sage-brush
66		*Artemisia scoparia* Waldst.	Virgate wormwood
67		*Artemisia frigida* Willd.	Wormwood
68		*Artemisia adamsii*Bess.	Wormwood
69		*Artemisia commutata* Bess	Wormwood
70		*Artemisia tanacetifolia L.*	Wormwood
71		*Centaurea adpressa Ledeb.*	Centaury
72		*Cirsium setosum (Willd.) Bieb*	Creeping thistle
73		*Saussurea salicifolia*(L.) DC.	Saw-wort
74		*Taraxacum officinale Wigg.*	Dandelion

APPENDIX 2b. Mammal species registered in the project region

Mongolian name of mammal species	Scientific name of mammal species	English name of mammal species	IUCN Red List (2006) Global category	Mongolian List of Rare Species, 2012	Redbook of Mongolia, 1987, 1997,213	CITES I, II appendix	Red List (2006)	Law on Fauna	Law on Hunting
RODENTIA									
1.Бараан хэрэм	*Sciurus vulgaris*	*Eurasian red squirrel*	*NT*	-	-	-	*NT*	-	*HA*
2.Замба жирх	*Tamias sibiricus*	*Siberian chipmunk*	*LC*	-	-	-	*LC*	-	-
3.Монгол тарвага	*Marmota sibirica*	*Siberian marmot*	*LC*	-	-	-	*EN*	-	*HA*
4.Сүүлэрхэг зурам	*Citellus undulatus*	*Long-tailed ground squirrel*	*LC*	-	-	-	*LC*	-	-
5.Хөхвөр олби	*Pteromys volans*	*Siberian flying squirrel*	*EN*	-	-	-	*EN*	-	-
6.Шивэр алагдаага	*Allactaga sibirica*	*Siberian jerboa*	*LC*	-	-	-	*LC*	-	-
7.Хөх шишүүхэй	*Cricetulus barabensis*	*Striped dwarf hamster*	*LC*	-	-	-	*LC*	-	-
8.Хадны барагчин	*Alticola semicanus*	*Mongolian silver vole*	*LC*	-	-	-	*LC*	-	-
9.Ойн хүрэн оготно	*Clethrionomys rufocanus*	*Grey red-backed vole*	*LC*	-	-	-	*LC*	-	-
10.Ойн улаан оготно	*Clethrionomys rutilus*	*Northern red-backed vole*	*LC*	-	-	-	*LC*	-	-
11.Цайвар үлийч	*Lasiopodomys brandti*	*Brandt's vole*	*LC*	-	-	-	*LC*	-	-
12.Өргөөнч оготно	*Microtus fortis*	*Reed vole*	*LC*	-	-	-	*LC*	-	-
13.Хэргэлзий оготно	*Microtus gregalis*	*Narrow-headed vole*	*LC*	-	-	-	*LC*	-	-
14.Ширгийн оготно	*Microtus maximowiczii*	*Maximowicz's vole*	*LC*	-	-	-	*LC*	-	-
15.Монгол оготно	*Microtus mongolicus*	*Mongolian vole*	*LC*	-	-	-	*LC*	-	-
16.Мэхээрч оготно	*Microtus oeconomus*	*Root vole*	*LC*	-	-	-	*LC*	-	-
17.Ойн хөвхөлжин	*Myopus schisticolor*	*Wood limming*	*LC*	-	-	-	DD	-	-
18.Азийн хулгана	*Apodemus peninsulae*	*Korean field mouse*	*LC*	-	-	-	*LC*	-	-

19.Чигчий хулгана	*Micromys minutus*	*Eurasian harvest mouse*	*LC*	-	-	-	*LC*	-	-
20.Сохор номин	*Myospalax aspalax*	*False zokor*	*LC*	-	-	-	DD	-	-
LAGOMORPHA									
21.Дагуурын огдой	*Ochotona dauurica*	*Daurian pika*	*LC*	-	-	-	*LC*	-	-
22.Асганы огдой	*Ochotona hyperborea*	*Northern pika*	*LC*	-	-	-	*LC*	-	-
23.Чандага туулай	*Lepus timidus*	*Arctic hare*	*LC*	-	-	-	*LC*	-	*HA*
24.Боролзон туулай	*Lepus tolai*	*Tolai hare*	*LC*	-	-	-	*LC*	-	*HA*
ERINACEIDA									
25.Дагуурын зараа	*Mesechinus dauuricus*	*Daurian hedgehog*	*LC*	-	-	-	*LC*	-	-
INSECTIVORA									
26.Малтаахай жөвүү	Crocidura sibirica	*Siberian shrew*	*LC*	-	-	-	DD	-	-
27.Дааган атаахай	*Sorex caecutiens*	*Laxmann's shrew*	*LC*	-	-	-	*LC*	-	-
28.Бэсрэг атаахай	*Sorex daphaenodon*	*Large-toothed shrew*	*LC*	-	-	-	*LC*	-	-
29.Тэгш атаахай	*Sorex isodon*	*Even- toothed shrew*	*LC*	-	-	-	*LC*	-	-
30.Цармын атаахай	*Sorex tundrensis*	*Tundra shrew*	*LC*	-	-	-	DD	-	-
31.Өөдсөн атаахай	*Sorex minutissimus*	*Miniscule shrew*	*LC*	-	-	-	*LC*	-	-
CHIROPTERA									
32.Умрын сарсаахай	*Eptesicus nilssoni*	*Northern bat*	*LC*	-	-	-	*LC*	-	-
33.Ойсог багваахай	*Myotis brandtii*	*Brandt's bat*	*LC*	-	-	-	DD	-	-
34.Уссаг багваахай	*Myotis daubentoni*	*Daubenton's bat*	*LC*	-	-	-	*LC*	-	-
35.Сахалт багваахай	*Myotis mystacinus*	*Whiskered bat*	*LC*	-	-	-	*LC*	-	-
36.Жижиг соотгой	*Plecotus auritus*	*Brown long-eared bat*	*LC*	-	-	-	*LC*	-	-
37.Буурал сармаахай	*Vespertilio murinus*	*Particoloured bat*	*LC*	-	-	-	*LC*	-	-
CARNIVORA									
38.Хүрэн баавгай	*Upsus arctos*	*Brown bear*	*LC*	+	+	-	DD	R	-
39.Еврази шилүүс	*Lynx lynx*	*Eurasian lynx*	*NT*	+	-	II	*NT*	R	*HA*
40.Мануул мий	*Otocolobus manul*	*Pallas's cat*	*NT*	-	-	II	*NT*	-	*HA*
41.Саарал чоно	*Canis lupus*	*Grey wolf*	*LC*	-	-	II	*NT*	-	*HA*
42.Шар үнэг	*Vulpes vulpes*	*Red fox*	*LC*	-	-	-	*NT*	-	*HA*

43.Хярс үнэг	*Vulpes corsac*	*Corsac fox*	*LC*	-	-	-	*NT*	-	*HA*
44.Загал элбинх	*Nyctereutes procyonoides*	*Raccoon dog*	*VU*	-	-	-	*LC*	-	*HA*
45.Нохой зээх	*Gulo gulo*	*Wolverine*	*VU*	-	-	-	*LC*	-	*HA*
46.Ойн булга	*Martes zibellina*	*Sable*	*VU*	-	-	-	*EN*	R	*HA*
47.Халздай дорго	*Meles meles*	*Eurasian badger*	*LC*	-	-	-	*LC*	-	*HA*
48.Солонго үен	*Mustela altaica*	*Mountain weasel*	*VU*	-	-	-	*LC*	-	*HA*
49.Өмхий үен	*Mustela eversmanni*	*Steppe polecat*	*LC*	-	-	-	*LC*	-	-
50.Хотны үен	*Mustela nivalis*	*Least weasel*	*LC*	-	-	-	*LC*	-	-
51.Модны үен	*Mustela sibirica*	*Siberian weasel*	*LC*	-	-	-	*LC*	-	-
ARTIODACTYLA									
52.Халиун буга	*Cervus elaphus*	*Red deer*	*LC*	+	+	-	CR	R	*HA*
53.Бор гөрөөс	*Capreolus pygargus*	*Siberian roe deer*	*LC*	-	-	-	*LC*	-	*HA*
54.Зэрлэг гахай	*Sus scrofa*	*Wild boar*	*LC*	-	-	-	*NT*	R	*HA*
55.Баданга хүдэр	*Moschus moschiferus*	*Siberian musk deer*	*VU*	+	+	II	*EN*	R	
56.Шивэр хандгай	*Alces alces*	*Eurasian elk*	*VU*	-	+	-	*EN*	VR	

APPENDIX 3: ENVIRONMENTAL DUE DILIGENCE PROCEDURE FOR OUTPUT 2

1. The nature of works involved in Output 2 of the Project is similar to Output 1, which focuses on routine road maintenance and road rehabilitation works. At the time of project appraisal, the location of road sections was not determined. Therefore, this section provides environmental due diligence procedure for Output 2 once the project location(s) is identified. The procedure presented below is based on the ADB's Safeguard Policy Statement and the government's Environmental Assessment Guidelines (2010).

A. General Environmental Assessment Procedure

2. **Output 2: Road asset management capacity and implementation improved**. This output will develop capacity in road asset maintenance and road funding, including maintenance planning and prioritization. The project activities for Output 2 will be within the similar workscope as Output 1. Once the location for Output 2 is determined, relevant baseline data collection and decription of environment will be provided as an addendum to this IEE. As the environmental management plan of this IEE is prepared according to the nature of the project and road maintenance and rehabilitation works, the current EMP will be applied for Output 2. If there is any need for revision, the EMP will be revised and updated.

3. The selection of locations for project activities for Output 2 will be carried out during the project implementation. MRTD screens potential road sections for road maintenenance and rehabilitation works based on the road conditions, importance of road corridors, current and projected traffic volumes, and regional and local transport networks. The following site selection criteria are provided to assist the screening. The selection criteria also include environmental criteria to ensure any activities of the **proposed project that fits environment category A are not permitted**.

4. **Site selection criteria**. The following criteria are developed to select the most suitable locations for activities related to Output 2 of the project:

(i) proposed project must improve road conditions in the road corridors;
(ii) proposed road section must be existing paved road
(iii) proposed road maintenance and rehabilitation works shall be similar to Output 1 of the project
(iv) proposed project activities must comply with Mongolian environmental legislation and ADB's SPS 2009;
(v) no involuntary land acquisition and resettlement of people required;
(vi) no negative impact on biodiversity, wetland, natural resources, and physical cultural resources;
(vii) no permanent negative impacts on loss of flora including pasture land;
(viii) project locations must have adequate distance (at least 100 meters) from any water bodies;
(ix) project sites mush not cause negative impacts on sensitive areas and habitats such as water-gathering grounds, nature conservation areas, protected ecological habitats, and physical cultural resources; and
(x) project sites must safeguard herder water supplies including all above ground well infrastructure.
(xi) proposed projects must not include prohibited activities as defined in Annex 5 of ADB's SPS 2009;

B. Environmental Due Diligence Procedure

5. Environmental categorization and screening shall be carried out by MRTD and approved by ADB. The following steps are required in order to categorize the project activities:

6. **Scoping**. When the project sites are proposed, before conducting the environmental assessment involving category B projects, a scoping exercise is recommended. The scoping exercise shall define the project's area of influence, i.e. the geographic boundary to be used to define impacts, potentially affected people, mitigation measures, monitoring tasks, the scope of public consultation and the eligibility range of the Grievance Redress Mechanism (GRM). Scoping is usually undertaken as part of the General EIA according to National legislation.

7. **ADB environmental categorization.** Following the scoping exercise, ADB's rapid environmental assessment (REA) checklist (Section D) of the project shall be developed based on site visits, discussions with local environmental protection authorities, and other relevant stakeholders. The REA checklist shall be completed by MRTD and submitted to ADB for review and approval.

8. **Environmental and Social Baseline Survey.** The baseline conditions for the project must be obtained through primary and secondary data collection using existing assessment reports, site visits, and any available secondary sources and relevant databases, such as topography; soils; geology; protected areas; sensitive areas; land use; social conditions; and all ambient air, noise and water quality conditions in the project site and vicinity of influence.

9. **Preparing the Detailed Project Description.** Based on the defined project activities and site locations of the project, prepare a detailed project description similar to Chapter III of the IEE.

10. **Preparing the location-specific Description of Environment.** Based on Environmental and Social Baseline survey, prepare the location-specific decription of the Environment similar to Chapter IV.

11. **Conducting Impact Assessment**. Predicting potential environmental impacts involves identification of environmental risks and anticipated impacts as a result of project implementation, including impacts on air and surface water quality, noise, risks to occupational and community health and safety, protected and sensitive ecological, socioeconomic and cultural resources. If there any additonal impacts and mitigation measures identifed, update the EMP accordingly.

12. **Conducting meaningful consultation.** As requirement to ADB SPS (2009), meaningful consultation with affected people needs to be organized and and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.

13. **Training Requirements**. If there is additional training requirements identified, update the training program of the IEE.

14. **Environmental Management Costs.** If additional costs associated with EMP implementation, training, EMP monitoring and reporting of Output 2, update relevant cost items in the IEE.

15. **Public Disclosure.** Disclose a draft addendum to the IEE at the ADB website, which includes additional environmental impact assessment results as a part of Output 2 environmental due diligence. That includes detailed project description, location-specific description of environment, process and results of meaningful consultation, and any updates in EMP, EMoP, training, and environmental costs in a timely manner. It is noted that the addendum to the IEE shall be consistent to the domestic DIEA. The DEIA shall be disclosed in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final addendum to the IEE or final DEIA if there are any updates to affected people and other stakeholders.

16. The addendum to the IEE and any updates in the IEE must be in accordance to the ADB's SPS, which must be submitted to ADB for approval prior to the implementation of the project actvities under Output 2.

C. Domestic Environmental Impact Assessment

17. In parallel to the environmental due diligence described earlier to meet the ADB SPS (2009), MRTD (and the PIU) is responsible to conduct proper environmental due diligence in accordance with the Mongolian EIA laws. Once the DEIA or any form of environmental impact assessment is prepared and approved, MRTD (and the PIU) must share the information on the DEIA status and content to the ADB. ADB will review the current IEE, update the IEE, if needed, to reflect the approved DEIA or any form of environmental impact assessment, and re-disclose it as needed.

D. Rapid Environmental Assessment Form

18. The following REA form shall be used for environmental categorization.

1. ENVIRONMENTAL MONITORING INTERVIEW FORM

Date of Interview:		**Interviewer Name:**	
Interview Site: *Where is the interview held? In school, on the road, in shop*		**Stakeholder Name & Status:** *Full name, status is business owner, school teacher, religious leader, resident*	
Construction Site & Date Construction Started *Which road, GPS location if available*		**Has this stakeholder been interviewed before?** *Yes (when were they interviewed) No*	
Interview Discussion Points			
1. Noise		**Record of Discussion**	
Before the project started, was the person disturbed by noise? If yes, explain how and when. *Where did the noise come from? E.g. traffic, machinery, people, music* *When did it disturb the person? E.g. all day, at night, intermittently*			
During the construction, is the person disturbed by noise from the project? If yes, explain how and when. *What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers etc* *When did it disturb the person? E.g. all day, at night, intermittently*			
If noise from construction is a problem, what changes does the person suggest are made?			

2. Air Quality	Record of Discussion
Before the project started, was the person affected by air pollution or dust? If yes, explain how and when. *Where did the pollution or dust come from? E.g. traffic, machinery, construction, burning garbage, cooking stoves* *When was the dust or pollution a problem? E.g. all day, at night, intermittently*	
During the project, is the person disturbed by dust or pollution? If yes, explain how and when. *What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers, burning construction garbage etc* *When did it disturb the person? E.g. all day, at night, intermittently*	
If dust or air pollution from the construction is a problem, what changes does the person suggest are made?	
3. Vegetation	**Record of Discussion**
Before the project started, what was the vegetation like along the road? *E.g. pasture land, trees, shrubs.*	
During the project, has the person found the vegetation situation has changed? If yes, explain how and when.	
If impact on vegetation is unacceptable, what changes does the person suggest are made?	
4. Road Safety	**Record of Discussion**
Before the project started, can you describe the road safety situation at the site/school/house etc?	

E.g. no problems, some accidents, difficulty crossing the roads	
During the project, has the person found the road safety situation has changed? If yes, explain how and when. *Slower traffic so easier to cross the roads, construction vehicles are making a crossing harder / easier, more accidents / less accidents*	
If change in road safety is unacceptable, what changes does the person suggest are made?	
5. Land Use and Access	**Record of Discussion**
During the project, has the person found the access for herders or other land users has changed? If yes, explain how and when *E.g. Change pasture quality, access to pasture on both sides of road*	
If change in land use and access is unacceptable, what changes does the person suggest are made?	
6. Other issues	**Record of Discussion**
Any other issues about the construction sites that the person wants to discuss? *E.g. Water / wastewater concerns, Garbage disposal, Other concerns*	

2. POST CONSTRUCTION ENVIRONMENTAL CONDITION MONITORING FORM

Date of Site Visit :			**Name of Monitor:**	
Type of Site Check (tick)	*Before Construction Ends*		*Post-Construction*	
Site Observations				
1. Condition of Site			**Observations**	
Garbage *Is there construction waste on the site? What type of waste? Is it hazardous? Where is it?*				
Land Condition *Is any disturbed land and soil properly contoured? Is it re-planted if re-vegetation is needed?*				
Contamination *Is any land or water at the site contaminated, with chemicals, garbage etc? Are any chemicals spills including fuel, visible?*				
Services & Infrastructure *Are any services damaged because of the construction? Are drains and culverts blocked or clean?* *Any damage to buildings, lighting, street signs etc ?*				
Community Health & Safety *Will the site cause a health and safety risk to the community? Are there trenches or pits? Are there other hazards which may impact on health?*				
Other Issues				

Requirements for Contractor	
Issue *List Issues and observations that the contractor is required to fix*	
Date Requirements Given to Contractor	
Date by Which Contractor Agrees to Fix Issues	

3. GRM COMPLAINT FORM

PIU Staff Responsible: (name and role)	
Date: (of this record)	

Date of Complaint:	
Date Resolution Required by (17 days from initial complaint):	
Complaint Made by: (Name & Contact Details)	
Method of Complaint: (direct to PIU, via Contractor, Via Bagh or soum)	
Details of Complaint: (issues, actions taken so far, when did it start – all details needed)	
PIU Actions: (Next steps for PIU to resolve the issue or to move complaint to next level)	
Follow Up Actions Needed and Date: (PIU to follow up on resolution if needed, e.g. check contractor actions, or escalate to next level)	