



## Initial Environmental Examination (Final Draft)

Project Number: 48186-005

June 2017

### MON: Regional Road Development and Maintenance Project

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



## CURRENCY EQUIVALENTS

(as of 23 March 2017)

(Bank of Mongolia middle exchange rates)

Currency Unit	–	Mongolian togrog (MNT)
MNT 1.00	=	\$0.0004066
\$1.00	=	MNT2,459.40

## ABBREVIATIONS

AP	–	Affected People
ASIA	–	<i>Aimag</i> Specialized Inspection Agency
ADB	–	Asian Development Bank
CAREC	–	Central Asia Regional Economic Cooperation
DSC	–	Design and Supervision Consultants
DEIA	–	Detailed Environmental Impact Assessment
ERRC	–	Eastern Regional Road Corridor
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
EHSMP	–	Environmental, Health and Safety Management Plan
EA	–	Executing Agency
GEIA	–	General EIA
GHG	–	Greenhouse Gas
GRM	–	Grievance Redress Mechanism
GRM	–	Grievance Redress Mechanism
HSMP	–	Health and Safety Management Plan
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
MAP 21	–	Mongolian Action Programme for the 21st Century
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
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
UNFCCC	–	UN Framework Convention on Climate Change
UNEP	–	United Nations Environment Programme
WHO	–	World Health Organisation

## WEIGHTS AND MEASURES

°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 <sup>2</sup>	–	Square kilometer
µg/m <sup>3</sup>	–	Microgram per cubic meter

## GLOSSARY

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

## NOTE

In this report, "\$" refers to US dollars.

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Date 29 June 2017  
Ref. 06/97

Mr. Jurgen Sluijter  
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The ADB Mission Leader,  
Transport and Communications  
Division, East Asia Department,  
Asian Development Bank

**TA 8852-MON: Regional Road Development and Maintenance Project**

Dear Mr. Sluijter,

The Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) for the captioned project are prepared and reviewed by the Ministry of Road and Transport Development in Mongolia.

This is to formally advise you that there is no objection to these being posted on the ADB website in accordance with the ADB disclosure procedure. We will implement all actions following what are required in EIA and EMP and accept the ADB's supervision and inspection for the EMP implementation.

We appreciate your support and help for our project processing.

Sincerely yours,

D. Dorjkhand  
Director General  
Road Policy Implementation and Coordination Department





## **EXECUTIVE SUMMARY**

### **A. The Project**

1. The project aims to enhance capacities and improve investment on road maintenance in Mongolia. The project outputs are (i) road condition and safety improved in two road sections of important CAREC road corridor 4b; (ii) road asset management capacity and implementation improved; and (iii) project preparation, supervision and implementation improved. The project impact will be improved physical connectivity, in accordance with the draft Asian Development Bank (ADB) Country Partnership Strategy 2017–2020; the project outcome will be improved road transport accessibility within the project area and between countries.

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 1 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.

4. This IEE focuses on Output 1 of the project. However, the environmental management plan (EMP) will cover Outputs 1 and 2 as the project activities for Outputs 1 and 2 would be within the similar scope of works. Output 3 will not trigger the need of environmental impact assessment.

5. 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.

6. 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.

7. The water resources in the Nalaikh–Choir corridor (Output 1a) are primarily groundwater wells used for herders and their livestock. Seven wells are within 100 meters (m) of the road including one within the right-of-way. In the Darkhan–Altanbulag corridor (Output 1b), 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.

8. 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.

9. The principal impacts during the design phase are associated with the planned relocation of trees, particularly from the pine forest area along the Output 1b corridor, where trees encroach into the right of way and reduce traffic safety. During the construction phase, there will be impacts in both corridors which 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.

10. 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**

11. 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.

12. 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.

13. In addition a robust program 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 the project implementation unit (PIU) staff. The grievance redress mechanism (GRM) will be in place and managed by the PIU to appropriately handle any complaints arising from project activities.

**D. Conclusion**

14. 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. Introduction

1. Since 1991, the Asian Development Bank (ADB) has supported the Government of Mongolia in developing a transport network that can facilitate economic and social development. Improved accessibility has had a positive impact on the lives of the poor. In 2015, a total length of the paved national roads in Mongolia was 5,684 kilometers (km), of which 2,736 km were upgraded from earthen or gravel roads or newly constructed between 2011 and 2015, representing a substantial increase of the road asset base. While investment in road construction has substantially increased, investment for road maintenance remain insufficient. Condition of the existing road network has deteriorated, which led to increase in traffic, travel time, vehicle maintenance cost, and road accidents.

2. The project aims to enhance capacities and improve investment on road maintenance in Mongolia. The project outputs are (i) road condition and safety improved in two road sections of important CAREC road corridor 4b; (ii) road asset management capacity and implementation improved; and (iii) project preparation, supervision, and implementation improved.

3. 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.

4. In Mongolia, road maintenance works are mainly conducted by state-owned and private maintenance companies which lack sufficient financial resources, road maintenance equipment, up-to-date maintenance technology, and qualified staff. The present arrangements are fragmented, and the individual companies are under-resourced and unable to invest in upgrading their performance. At the same time, private contractors are unable to bid for routine maintenance works currently performed by the state-owned companies and opportunities for the existing private companies are limited. To improve road maintenance, the maintenance companies need to be consolidated and strengthened, and the legal and regulatory framework for road maintenance needs to be revised to encourage private sector participation on a competitive basis in accordance with international best practice.

### B. Project Impacts, Outcomes, and Outputs

5. The project impact will be improved physical connectivity, in accordance with the draft ADB Country Partnership Strategy 2017–2020; the project outcome will be improved road transport accessibility within the project area and between countries.

6. **Output 1: Road condition and safety improved.** This output will preserve and improve two important regional road sections linking Mongolia’s capital with the People’s Republic of China and the Russian Federation (CAREC road corridor 4b). The first will improve 201.4 km between Nalaikh (25 km south of Ulaanbaatar) and Choir (**Output 1a**), including 184.8 km of surface dressing, 1.0 km of routine maintenance, 15.6 km of rehabilitation and construction of 3.5 km of climbing lanes within the existing right-of-way. The second will improve 118.1 km between Darkhan and Altanbulag (**Output 1b**), including 85.6 km of surface dressing, 5 km of asphalt concrete overlay, 27.5 km of routine maintenance and construction of 7 km of climbing lanes within the existing right-of-way. Safety features such as road markings, barriers and guide posts are included in the works for both sections. Approximately \$26.7 million is to be allocated to

maintenance requirements on these two roads, with the priority for implementation being Nalaikh–Choir. This IEE is the environmental due diligence of this project output.

7. **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 description 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. Appendix 3 provides environmental due diligence procedure for Output 2.

8. **Output 3: Project preparation, supervision, and implementation improved.** Capacity development in project supervision and implementation. Due to the nature of this project output, no environmental assessment is needed.

Figure 1: Project Location



## C. Structure of This Report

9. 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 the 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 (a) physical; (b) biological; (c) socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues); (d) physical cultural resources in the context of the project's area of influence; and (e) 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 is 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) GRM presents the measures established to handle grievances and complaints arising during project implementation. It defines GRM entry points, timeframe, and institutional responsibilities of the GRM.
- (viii) 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) Appendixes.



## II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### A. Mongolia's Environmental Policy

10. 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.<sup>1</sup>

11. 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 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.

12. 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.

13. 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
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

<sup>1</sup> UNDP. 2008. Institutional Structures for Environmental Management in Mongolia. Ulaanbaatar and Wellington.

Convention	Year of Accession
World Heritage Convention	1990
Convention on the Conservation of Migratory Species of Wild Animals	1999

14. 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
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**

15. 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**

16. 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.<sup>2</sup> This IEE is intended to meet SPS 2009 requirements.

17. 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 nongovernment 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;
- (iii) Impacts and risks will be analyzed in the context of the project's area of influence;
- (iv) 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;
- (v) The assessment will identify potential transboundary effects as well as global impacts; and
- (vi) 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.

18. 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: (a) a draft full EIA (including the draft EMP) at least 120 days prior to ADB Board consideration; (b) the final EIA; (c) a

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<sup>2</sup> 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>.

- new or updated EIA and corrective action plan prepared during project implementation, if any; and (d) semiannual 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**

19. The EIA requirements of Mongolia are regulated by the Law on EIA (1998, amended 2002<sup>3</sup> 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.

20. 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.<sup>4</sup> The 2012 amendment introduces a requirement for strategic environmental assessment (SEA) for policy documents, and increases emphasis on public participation during a general EIA.

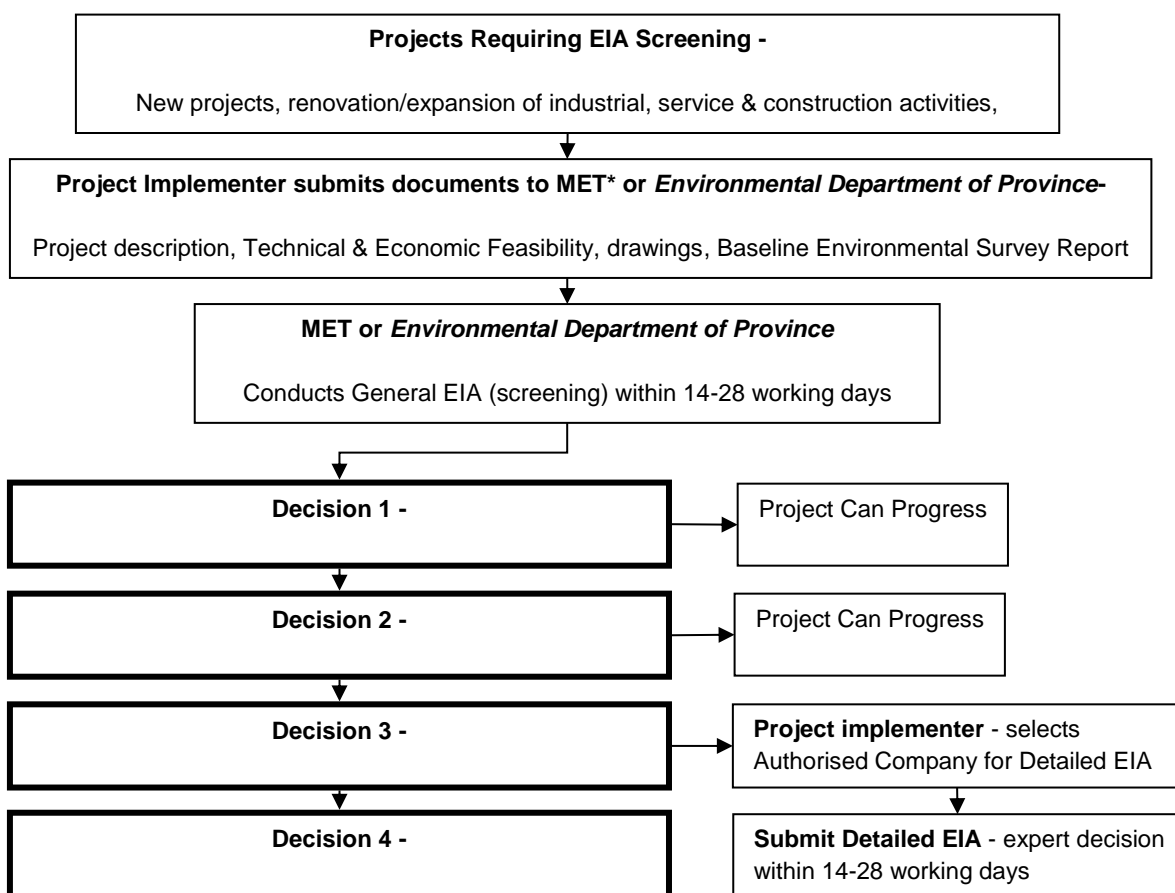
21. The purpose of the EIA law is environmental protection, the prevention of ecological imbalance, the regulation of natural resource use, the assessment of environmental impacts of projects and procedures for decision-making regarding the implementation of projects. The EIA process in Mongolia is summarized in Figure 2.

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<sup>3</sup> Law of Mongolia on Environmental Impact Assessments (1998, amended in 2002). Unofficial translation available from <http://cdm-mongolia.com>.

<sup>4</sup> 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:

**Figure 2: EIA Process in Mongolia**



MNT = Ministry of Environment and Tourism.

Source: Adapted from Vol. 1 (2001) Compendium of Laws: A Mongolian Citizens Reference Book.

22. 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 GEIA, 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 GEIA, technical details, drawings, and other information. The GEIA may lead to one of four conclusions: (a) no detailed EIA is necessary, (b) the project may be completed pursuant to specific conditions, (c) a detailed EIA is necessary, or (d) 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 DEIA 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 DEIA 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: (a) project alternatives; (b) analysis of adverse impacts and their consequences; (c) recommendations for minimizing, mitigation and elimination of impacts; (d) ecological loss assessment (e) risk assessment on human health and environment; (vi) EMP; (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.

23. 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 is any additional requirements on environmental mitigation measures from the approved DEIA, the IEE will be revised to reflect those.

### C. Environmental Standards

24. **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 <sub>4</sub> -N	mgN/l	0.5
NO <sub>2</sub> -N	mgN/l	0.002
NO <sub>3</sub> -N	mgN/l	9
PO <sub>4</sub> -P	mgP/l	0.1
Cl	mg/l	300
F	mg/l	1.5
SO <sub>4</sub>	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 <sup>6+</sup>	mg/l	0.01
Zn	mg/l	0.01
Hg	mg/l	0.1
Oil	mg/l	0.05
Phenol	mg/l	0.001
Active and washing substances	mg/l	0.1
Benzapyren	Mkg/l	0.005

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

25. 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 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 ( $\mu\text{g}/\text{m}^3$ )	WHO Ambient Air Quality Guidelines	Averaging Period
Nitrogen Dioxide ( $\text{NO}_2$ )	20 Minute	85		
	1 hour	-	200	1 hour
	24 hour	40		
	Annual	30	40	Annual
Sulphur Dioxide ( $\text{SO}_2$ )	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 ( $\text{PM}_{10}$ )	24 hour	100	50	24 hour
			150	24 hour IT-1
	Annual	50	20	Annual
			70	Annual IT-1
Particulate Matter ( $\text{PM}_{2.5}$ )	24 hour	50	25	24 hour
			75	24 hour IT-1
	Annual	25	10	Annual
			35	Annual IT-1
Carbon Monoxide ( $\text{CO}$ )	30 Minute	60,000		
	1 hour	30,000	30	1 hour
	8 Hour	10,000		
Ozone ( $\text{O}_3$ )	8 hour	100	100	8 hour
			160	8 hour IT-1
Lead (Pb)	24 hour	1		
	Annual	0.5		
Hydrogen Chloride ( $\text{HCl}$ )	1 hour	-		

Source: Mongolian Law on Air.

26. Table 5 summaries Mongolian ambient water quality standards MNS 4585: 2007, Table 6 summaries Mongolian drinking water standards MNS 0900: 2005, and 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 8.

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

Parameter	Unit	Standard
(pH)		6.5-8.5
Dissolved Oxygen ( $\text{O}_2$ )	mgO/l	6&4 not less
BOD	mgO/l	3
COD	mgO/l	10
$\text{NH}_4\text{-N}$	mgN/l	0.5
$\text{NO}_2\text{-N}$	mgN/l	0.02
$\text{NO}_3\text{-N}$	mgN/l	9
$\text{PO}_4\text{-P}$	mgP/l	0.1

Parameter	Unit	Standard
Chloride Cl	mg/l	300
Fluoride F	mg/l	1.2
SO <sub>4</sub>	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 <sup>6+</sup> )	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
<b>Physical Quality</b>		
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
<b>Inorganic Quality</b>		
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 (Ca <sup>2+</sup> )	mg/l	100.0
Magnesium (Mg <sup>2+</sup> )	mg/l	30.0
Manganese (Mn)	mg/l	0.1
Sodium (Na)	mg/l	200.0
Phosphate (PO <sub>4</sub> <sup>-</sup> )	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 <sub>4</sub> <sup>-</sup> )	mg/l	500.0
Chloride (Cl)	mg/l	350.0
Arsenic (As)	mg/l	0.01
Hydrogen sulphide (H <sub>2</sub> S)	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



Parameter	Unit	Standard
Total mercury (Hg)	mg/l	0.001
Total cyanide (CN <sup>-</sup> )	mg/l	0.01
Ammonium ion, (NH <sub>4</sub> <sup>+</sup> )	mg/l	1.5
Nitrate ion, (NO <sub>3</sub> <sup>-</sup> )	mg/l	50.0
Nitrite ions (NO <sub>2</sub> <sup>-</sup> )	mg/l	1.0
Phosphate ions, (PO <sub>4</sub> <sup>3-</sup> )	mg/l	3.5
Silver (Ag)	mg/l	0.1
Iodine (I <sub>2</sub> )	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
<b>Organic Quality</b>		
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
<b>Pesticides</b>		
Atrazine	mg/l	0.002
Carbofuran	mg/l	0.007
Lindane	mg/l	0.002
Molinate	mg/l	0.006
Endrin	mg/l	0.00006
<b>Microbial Quality</b>		
Total Coliform	Coli / ml	100 (at source) 20 (at supply)
E.Coli	E.Coli / 100 ml	E.Coli / 100 ml
<b>Radiological Quality</b>		
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	C°	20
pH	-	6-9
Odor	Sense	No smell
Total Suspended Solids (TSS)	mg/l	50
BOD	mg O <sub>2</sub> /l	20
COD	mg O <sub>2</sub> /l	50
Permanganate oxidizing capacity	mg O <sub>2</sub> /l	20
Total Dissolved Solids (TDS)	mg/l	1,000 *
Ammonia Nitrogen (NH <sub>4</sub> )	mg N/l	6

Parameter	Unit	Standard
Total Nitrogen (TN)	mg/l	15
Total phosphorous (TP)	mg/l	1.5
Organic phosphorous (DOP)	mg/l	0.2
Hydrogen sulphide (H <sub>2</sub> S)	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 (Cr <sup>6+</sup> )	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 <sub>6</sub> H <sub>5</sub> OH)	mg/l	0.05
Trichloroethylene (C <sub>2</sub> HCl <sub>3</sub> )	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 <sup>+</sup>	mg/l	200		None established
K <sup>+</sup>	mg/l	200		None established
Ca <sup>2+</sup>	mg/l	100		-
Mg <sup>2+</sup>	mg/l	30		-
SO <sub>4</sub> <sup>2-</sup>	mg/l	500		None established
HCO <sub>3</sub> <sup>-</sup>	mg/l	-		-
CO <sub>3</sub> <sup>2-</sup>	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 <sub>4</sub>	mg/l	1.5		None established
NO <sub>3</sub>	mg/l	50	mg/l	50
NO <sub>2</sub>	mg/l	1	mg/l	3
PO <sub>4</sub>	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 established
Se	mg/l	0.01	mg/l	0.04
E.coli or thermotolerant coliform bacteria		-		Must not be detectable in any 100 ml sample.

27. **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<sub>eq</sub>) and 45 dB (maximum for an individual noise event), and outdoor sound levels should not exceed 50 dB LA<sub>eq</sub>.

28. As for construction noise, IFC EHS Guideline: Occupational health and safety standards indicates IFC EHS Guideline: Occupational Health and Safety: 85 (Equivalent level LA<sub>eq</sub>,8h) 110 (Maximum L<sub>Amax</sub>,fast).

#### D. Specially Protected Areas

29. **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.

30. 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*).

31. **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<sup>5</sup>.

## **E. Laws on Wildlife and Habitat Protection**

32. Law on Fauna (last amended in 2012) 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 1996.<sup>6</sup>

## **F. Mongolia's Occupational Health and Safety Standards**

33. 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 2008-2027.<sup>7</sup>

34. 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**

35. **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 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.

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<sup>5</sup> UNDP Project Document: Strengthening of the Protected Area Network in Mongolia (SPAN) (2010).

<sup>6</sup> Note the bordering countries of Russia and China are not signatory parties to CMS. 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](http://www.unescap.org/ttdw/common/TIS/CorridorStudy/EGM_Bishkek/7-Mongolia.pdf).

<sup>7</sup> 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](http://www.unescap.org/ttdw/common/TIS/CorridorStudy/EGM_Bishkek/7-Mongolia.pdf).

### III. DESCRIPTION OF THE PROJECT

#### A. Rationale

36. **Strategic context.** The length of the paved national roads in Mongolia at the end of 2015 was 6,406 km, of which 4,022 km were constructed and commissioned between 2011 and 2015, representing a substantial increase of the road asset base. While investment in road construction has substantially increased, this has not been matched by commensurate increases in road maintenance. Consequently, road maintenance has been insufficient and the condition of the existing road network has deteriorated.

37. Now that the road network is becoming more developed, Mongolia needs to improve its approach to road maintenance since timely road maintenance is much less costly than allowing roads to deteriorate the extent that rehabilitation is needed. Empirical and economic analysis shows that every dollar spent on well-chosen preventive maintenance saves four dollars in avoided rehabilitation at a later stage<sup>8</sup>. Today, about 1,140 km of roads are aged 5–13 years and need periodic maintenance. About 756 km are older than 13 years and require reconstruction. About 292 km of roads, including the sections from Ulaanbaatar to Altanbulag, and Ulaanbaatar to Choir have already seriously deteriorated and require urgent periodic maintenance or reconstruction. A substantial investment in a periodic maintenance and rehabilitation program is therefore needed. To ensure future sustainability, the government needs to increase road maintenance financing, strengthen its road asset management (RAM) system for prioritizing maintenance works, and build associated institutional capacity.

38. **Road maintenance in Mongolia.** Road maintenance works are mainly conducted by 20 state-owned road maintenance companies and 8 private maintenance companies. These lack sufficient financial resources, road maintenance equipment, up-to-date maintenance technology and qualified staff. With many road maintenance companies and each one assigned to maintain only a relatively small portion of the road network, the present arrangements are fragmented, and the individual companies are under-resourced and unable to invest in upgrading their performance. At the same time, private contractors are unable to bid for routine maintenance works currently performed by the 20 state-owned companies and opportunities for the existing 8 private companies are limited. To improve the execution of road maintenance, the maintenance companies need to be consolidated and strengthened, and the legal and regulatory framework for road maintenance needs to be revised to encourage private sector participation on a competitive basis in accordance with international best practice.

39. **Value added by ADB assistance.** During 2010 to 2013, ADB had an extended dialogue with the government to formulate and implement a road sector roadmap and capacity development strategy.<sup>9</sup> This road map established medium- and long-term performance objectives for the road subsector and set up a series of targets and actions to be implemented. To support the implementation of priority reforms and build capacity, ADB approved a technical assistance (TA) for Road Sector Capacity Development<sup>10</sup>. The TA has assisted the government to implement the initial phase of the road map and has developed legal, technical and managerial arrangements to increase the efficiency and sustainability of road asset management.

<sup>8</sup> World Bank, 1998. Commercial Management and Financing of Roads. World Bank Technical Paper No. 409. Washington DC.

<sup>9</sup> ADB. 2010. Technical Assistance to Mongolia for Preparation of a National Road Sector Capacity Development Roadmap. Manila. The Government of Mongolia approved the road map at the cabinet level on 24 August 2011.

<sup>10</sup> 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).

40. The TA helped the government to identify a set of prioritized works for inclusion in a periodic maintenance and rehabilitation program for ADB financing, which is implemented through the proposed project. To ensure timely implementation, government agencies will be provided procurement and project management consulting support and extensive training. Particular attention will be paid to institutional strengthening with respect to maintenance financing, maintenance prioritization, consolidation and increase of efficiency and capacity of road maintenance companies, introduction of performance-based road maintenance contracts, opening the road maintenance market for private contractors and other steps aimed at increasing efficiency and sustainability of the road asset management.

## B. Project Impact, Outcome and Outputs

41. The project is aligned with the following impact: Improved physical connectivity (draft ADB Country Partnership Strategy 2017-2020). The project outcome will be improved road transport accessibility within the project area and between countries.

42. **Output 1:** Road condition and safety improved. This output would preserve and improve two important regional road sections linking Mongolia's capital with the People's Republic of China and the Russian Federation (CAREC road corridor 4b). The first would improve 201.4 km between Nalaikh (25 km south of Ulaanbaatar) and Choir (Output 1a), including 184.8 km of surface dressing, 1.0 km of routine maintenance, 15.6 km of rehabilitation and construction of 3.5 km of climbing lanes within the existing right-of-way. The second would improve 118.1 km between Darkhan and Altanbulag (Output 1b), including 85.6 km of surface dressing, 5 km of asphalt concrete overlay, 27.5 km of routine maintenance and construction of 7 km of climbing lanes within the existing right-of-way. Safety features such as road markings, barriers and guide posts are included in the works for both sections. Approximately \$26.7 million is to be allocated to maintenance requirements on these two roads, with the priority for implementation being Nalaikh–Choir. This IEE is the environmental due diligence of this project output.

43. The road sections were selected taking into consideration of the current road condition, which has been significantly deteriorated overtime due to lack of routine road maintenance work; and the importance of regional roads connectivity. The current traffic volume of these road sections are provided as below, which is expected to grow along with future economic growth in Mongolia.

**Table 9: Observed Traffic Volumes (2016 AADT)**

	Car	SUV	Minibus	Bus	Light truck	Medium truck	Heavy truck	Total
Darkhan-Altanbulag	1,201	254	110	38	95	109	68	1,875
Nalaikh-Choir	654	164	41	15	102	49	134	1,159

AADT = annual average daily traffic, SUV = sport utility vehicle.

Source: Ministry of Road and Transport Development.

44. **Output 2:** Road asset management capacity and implementation improved. This output would develop capacity in RAM and road funding, including maintenance planning and prioritization. Pilot performance-based maintenance packages would be designed and implemented. Training in maintenance, procurement and safeguards, and piloting of new technologies is also recommended. Implementation of improved methods would be demonstrated through a number of maintenance packages to be procured through national competitive bidding. The total estimated cost is \$10.7 million. Maintenance and rehabilitation contracts under this output are subject to ADB's technical, economic and safeguards due diligence to be financed by the loan. As no determination on locations and specific activities of this output, an additional

environmental due diligence will be carried out following the proper procedure described in Appendix 3 to meet the ADB SPS (2009).

45. **Output 3:** Project preparation, supervision and implementation improved. Capacity development in project supervision and implementation, including standard project supervision. Training in maintenance, procurement and safeguards, and piloting of new technologies is also recommended. Estimated cost is \$1.3 million. Due to the nature of this project output, no environmental impact assessment is needed.

### C. Detailed Description of the Project

46. Output 1 of the project is the scope of this IEE (hereafter Output 1 of the project refers to 'the project'). The location of the project is shown in Figure 3.

**Figure 3: Project Location**



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

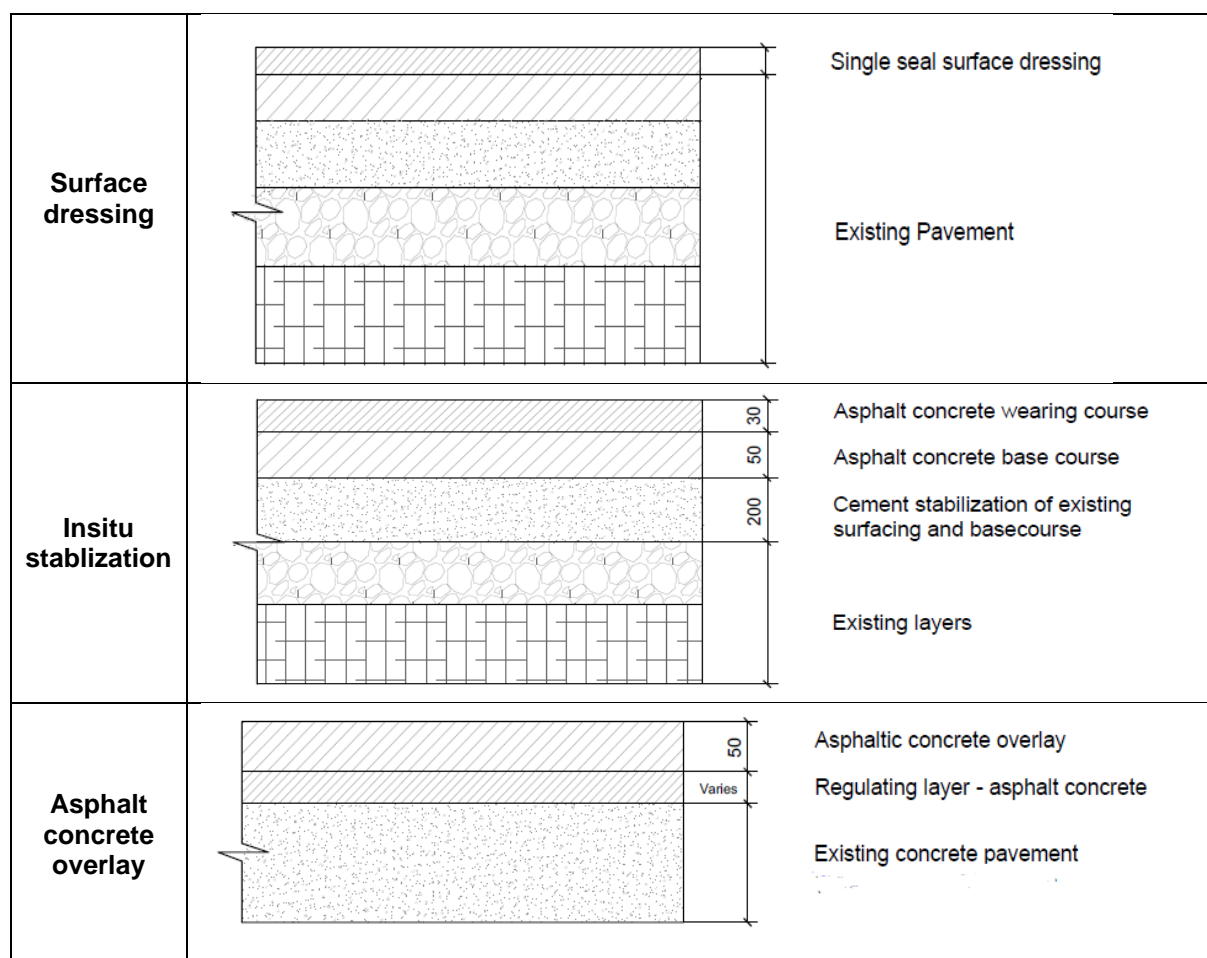
47. The project involves road maintenance and rehabilitation works. Routine **maintenance works** typically include pothole patching and crack sealing. A total length of road maintenance work is 28.5 km, consisting 1 km between Nalaikh and Choir (Output 1a), and 27.5 km between Darkhan and Altanbulag (Output 1b).

48. Three types of road **rehabilitation works** are involved in the project: (i) surface dressing; (ii) insitu 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) bituman 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.

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



Source: ADB PPTA consultant (2017).

49. **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. Surface dressing will be carried out in a total of 270.4 km existing road, consisting 184.8 km between Nalaikh and Choir (Output 1a) and 85.6 km between Darkhan and Atlanbulag (Output 1b).



**Figure 5. Typical look of surface dressing**



Source: Wikipedia.

50. **Insitu stabilization.** Insitu stabilization is applied when existing crushed stone aggregate base course is failed. Insitu 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), insitu 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. Insitu stabilization will be carried out in a total of 15.6 km existing road only between Nalaikh and Choir (Output 1a).

**Figure 6. Sample image of Insitu stabilization process**



Source: ADB PPTA team (2017).

51. **Asphalt concrete overlay.** In the existing concrete pavement, asphalt concrete overlay will be applied to improve ride quality and extend the life of road. Asphalt concrete overlay will be carried out in a total of 6.3 km existing road, consisting 1.3 km between Nalaikh and Choir and 5 km between Darkhan and Atlanbulag.

**Figure 7. Typical look of asphalt concrete overlay**

Source: Wikipedia

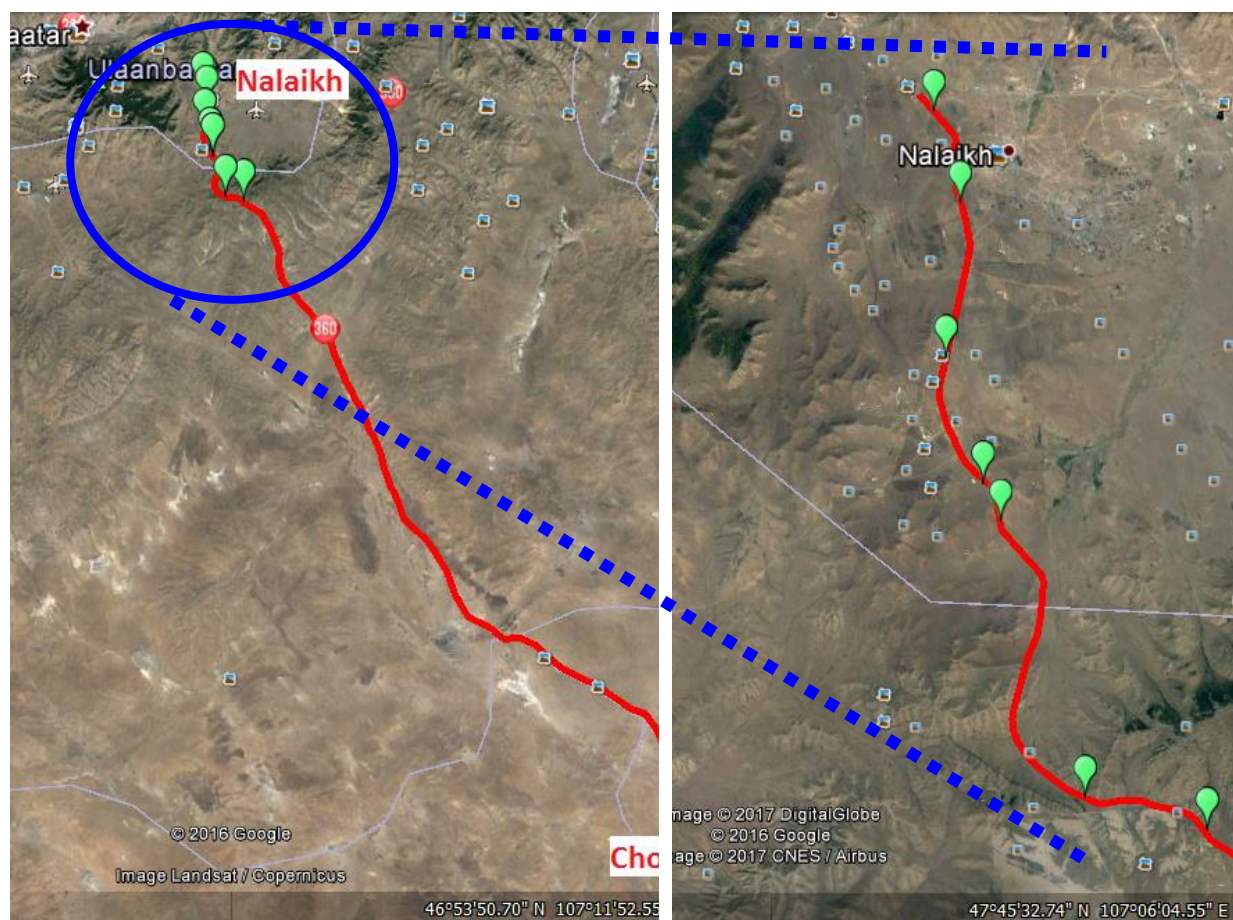
52. **Climbing lane construction.** To ease spot road congestion and improve road safety, a total of 14 locations (7 locations between Nalaikh and Choir and 7 locations between Darkhan and Atanbulag) with a total of 10 km of climbing lanes will be constructed. It involves widening existing embankment 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 10. Climbing lanes between Darkhan-Atanbulag**

From	To	Road Direction	Length of Climbing Lane
32+900	33+160	Southbound	260 m
42+120	42+410	Southbound	290 m
52+690	53+400	Southbound	710 m
30+070	30+595	Northbound:	530 m
37+465	38+450	Northbound:	990 m
42+910	43+305	Northbound:	400 m
56+910	57+195	Northbound:	290 m
<b>TOTAL</b>			<b>3.5 km</b>

Source: ADB PPTA consultant (2017).

**Figure 8: Nalaikh-Choir Road Rehabilitation with the Locations of Climbing Lanes**



Source: Google earth map and ADB PPTA team (2017).

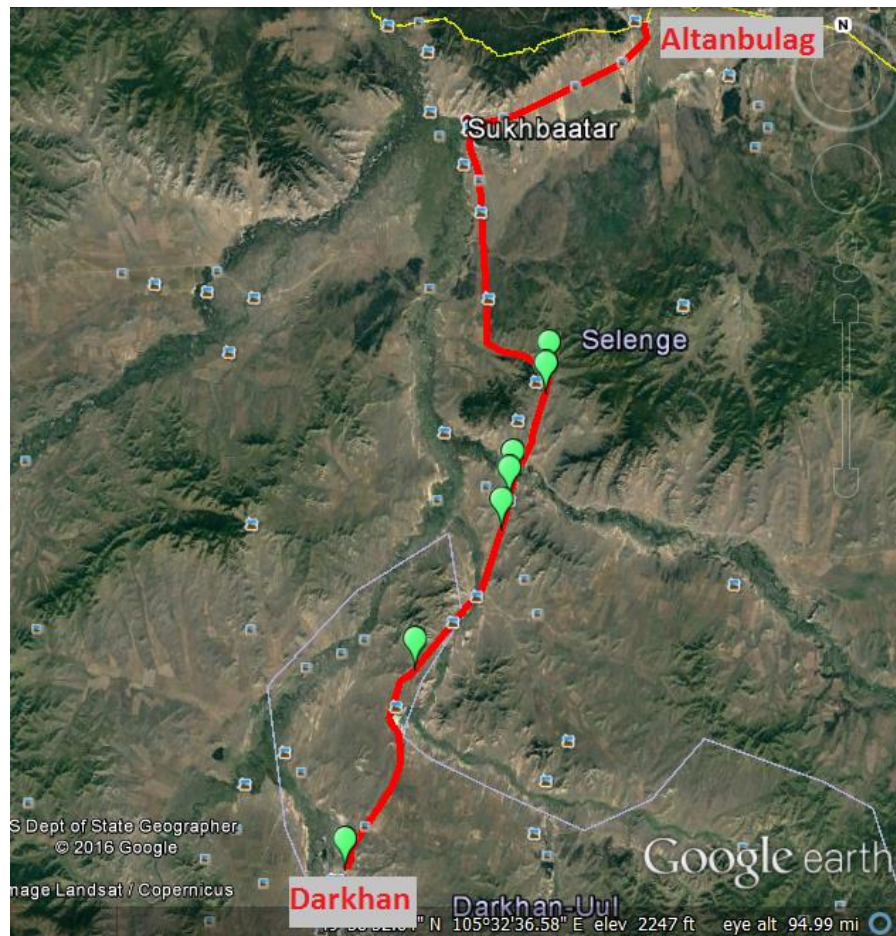
**Table 11. Climbing lanes between Darkhan-Atanbulag**

From	To	Road Direction	Length of Climbing Lane
251+400	251+900	Southbound	500 m
272+700	276+50	Southbound	3350 m
288+700	289+250	Southbound	550 m
226+500	227+200	Northbound:	700 m
270+100	270+500	Northbound:	400 m
271+700	272+100	Northbound:	400 m
285+500	286+150	Northbound:	650 m
<b>TOTAL</b>			<b>6.5 km</b>

Source: ADB PPTA consultant (2017)



**Figure 9: Darkhan- Altanbulag Road Rehabilitation with the locations of climbing lanes**



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

#### **D. Associated Facilities**

53. 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**

54. 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.

55. 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 for Output 1a are principally those concentrated in the main towns primarily Choir (Govisumber aimag), Bayan (**Tov** aimag) and Nalaikh (Ulaanbataar municipality); for Output 1b, the key communities are Darkhan (Darkhan-Uul aimag) Sukhbataar and Altanbulag (Selenge aimag). In addition nomadic herders move around the project area depending on the time of year. Data from the DEIA draft indicate that for the soums in the Nalaikh-Choir corridor, 20 to 70% of households are herders and approximately 19% in the Darkhan-Altanbulag corridor.

## B. Geography, Topography and Geology

### 1. Administration.

56. Administratively, Mongolia is divided into 21 *aimags* (provinces) and the capital city Ulaanbaatar. *Aimags* are divided into *soums* which are further divided into bags. Output 1a (Choir-Nalaikh) traverses the aimags of Govisumber, Tov and Ulaanbataar municipality. Output 1b (Darkhan- Altanbulag) traverses Darkhan-Uul aimag and Selenge aimag.

### 2. Topography and soil conditions

57. Topography and soil conditions that are provided here was based on base data collection commissioned by the ADB PPTA. Base data collection was carried out two licensed EIA institutes under the Mongolian laws and regulations. vided in the DEIA draft.

58. **Output 1a (Choir-Nalaikh corridor):** The landscape between Choir and the Bayantal soum is described as low mountains, plains and sloping depressions in the valleys between the mountains. A survey of soil was made at 12 locations as shown in Table 12. Brown soil type of a desert steppe zone is observed in the 85 km valley between Bayantal soum and Bayn soum. Mountainy brown soil type was observed in the 15 km road section between Bayan soum and Bagahngai town. Soil type of meadow steppe is observed in the road section between Bagahngai town and Nalaikh town. In all locations sampled, the 0-20cm sample contained loamy soils, except location 11 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 12: Soil Sampling Locations Output 1a Corridor**

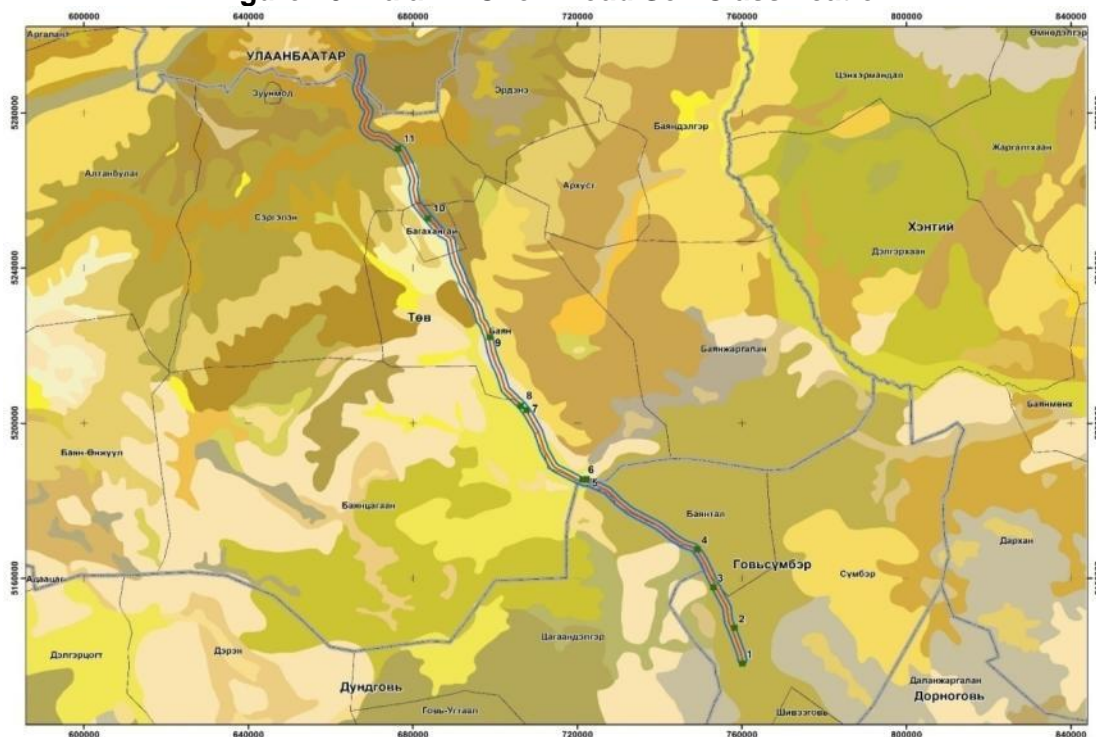
<b>№</b>	<b>X LONGITUDE</b>	<b>Y LATITUDE</b>	<b>Elevation</b>	<b>Soum</b>	<b>Distance from embankment</b>
<b>1</b>	298447	5135830	1281	Sumber soum	840m
<b>2</b>	297265	5145053	1280	Sumber soum	735m

3	292887	5455942	1280	Sumber soum	605m
4	299770	5165997	1252	Bayantal soum	291m
5	722238	5185545	1294	Bayan soum	729m
6	711272	5885570	1292	Bayan soum	315m
7	707670	5203361	1331	Bayan soum	235m
8	706250	5204452	1329	Bayan soum	250m
9	698679	5222122	1383	Bayan soum	276m
10	683628	5252775	1480	Bagahankgai	165m
11	676390	5270708	1718	Sergelen soum	240m

Source: DEIA draft (2017).

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

**Figure 10: Nalaikh-Choir Road Soil Classification**



Source: DEIA draft (2017).

60. Output 1b (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 11.

**Figure 11: Topography Corridor 1b**

Source: DEIA Team

61. 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 Table 13 and shown in Figure 12.

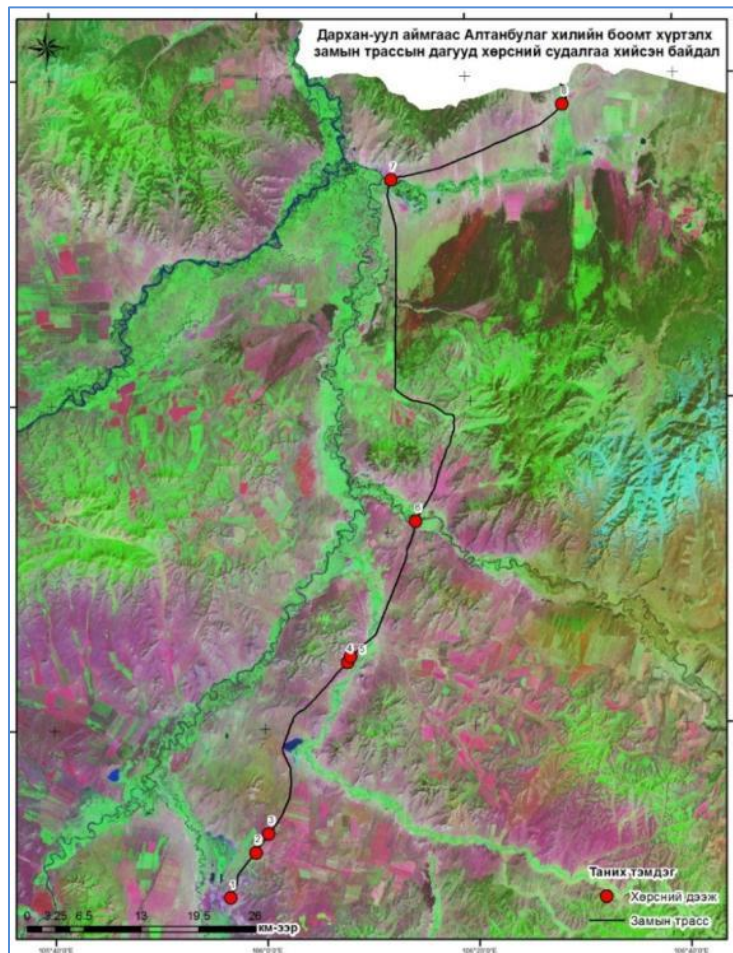
**Table 13: Soil Sampling Locations Output 1b Corridor**

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: DEIA Team.



**Figure 12: Sampling Location Map Output 1b Corridor**

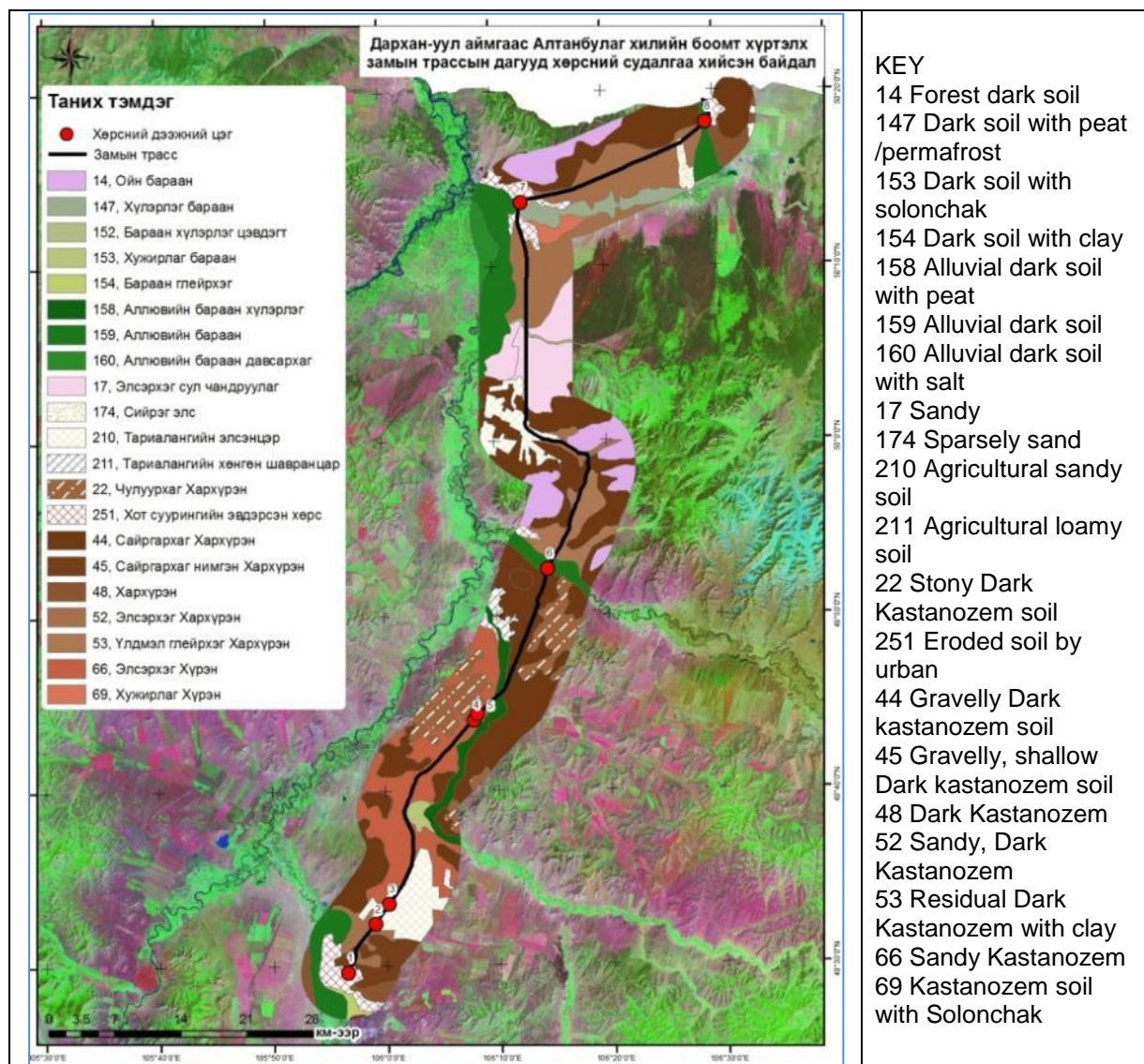


Black line = road alignment, red dots = sampling locations.  
Source: DEIA Team.

62. 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 13. The soil characteristics map indicates that the predominant soil types are meadow soil and dark brown soil.



Figure 13: Soil Characteristics Output 1b Corridor



Source: DEIA Team.

63. 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 Table 14 for results.

**Table 14: Soil Analysis Results**

Sampling No.	Depth, cm	*pH	CaCO <sub>3</sub> %	Humus %	*EC	Mobile Phosphorous & Potassium mg/100g	
						P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
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).

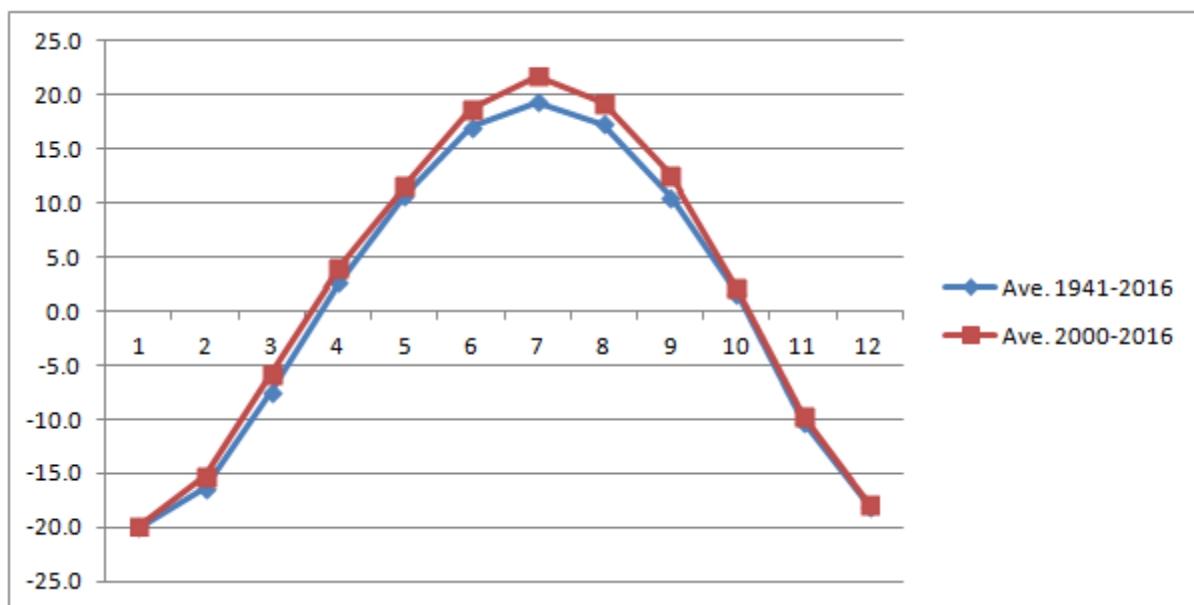
Source: DEIA Team.

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

### **C. Meteorology and Climate**

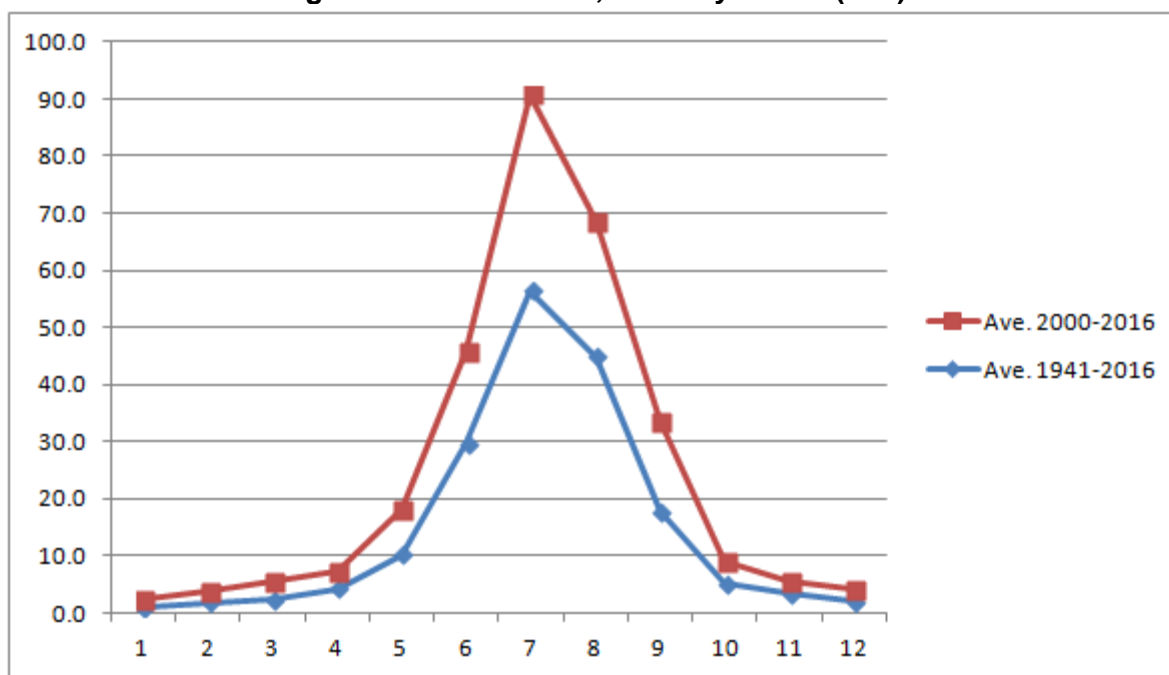
65. Climate data for **Choir** (Figure 14 and Figure 15) provide figure for the average temperature and rainfall data from 1941 to 2016 and also give a comparison with a more recent average, from 2000-2016. The data show that the average temperatures are increasing and there is a change in average rainfall, in Choir is increasing.

**Figure 14 Temperature, Choir by Month (Degree Celsius)**



Source: Data provided by DEIA Team.

**Figure 15 Rainfall Data, Choir by Month (mm)**



Source: Data provided by DEIA Team.

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

67. **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 Table 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, (see Table 16). Given the temperatures, the land surface is covered with snow for approximately 110-130 days a year.

**Table 15: Mean precipitation by months (2011-2015 period), mm**

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: Snow days by Month**

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

68. **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. Table 17 to Table 19 show the mean, maximum and minimum air temperatures for the region.

**Table 17: Mean air temperature, °C**

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 18: Maximum air temperature, °C**

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 19: Minimum air temperature, °C**

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

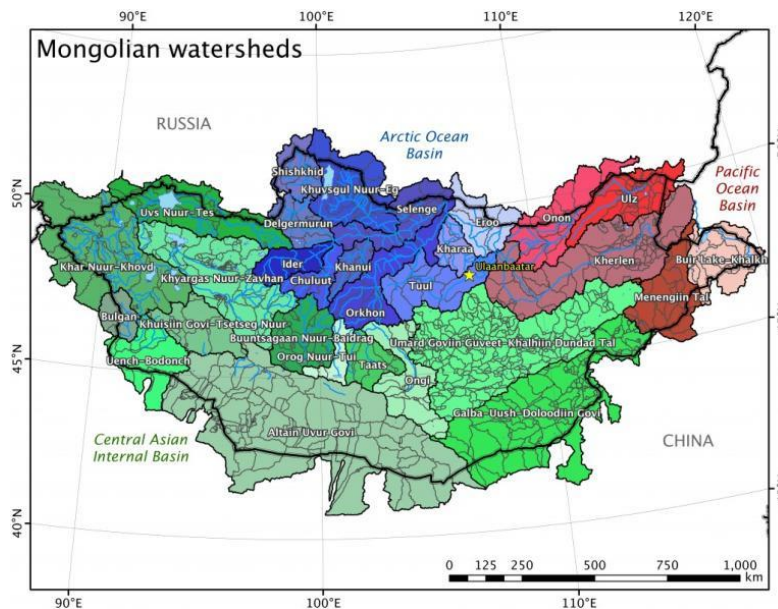
69. **Wind.** Based on the last 15 years' climate data, dust or snow storms occur on around 10-24 days a year. The predominant wind direction is from northwest to south east. Dust storms usually occur in April and May. The average wind speeds are shown in Table 20.

**Table 20: Average wind speed, m/sec**

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

#### **D. Hydrology, Surface and Ground Water**

70. General Hydrology. Output 1a (Nalaikh-Choir corridor) is in the eastern part of Mongolian which is drains into the central asian internal basin; and Output 1b (Darkhan-Altanbulag corridor) drains to the north, into the arctic ocean basin, see Figure 16.

**Figure 16: Mongolian Watersheds**

Source: Watersheds of Mongolia, Free C. (2015) Rutgers University<sup>11</sup>

71. **Output 1a (Choir-Nalaikh corridor).** The DEIA team conducted field water resource survey in a 1 km wide road corridor along the Nalaikh-Choir road corridor. No surface water resources were noted by the DEIA team within the road corridor.

72. Five springs are in the corridor; one has surface flow and the remainder are underground and cannot be sampled. The 3 springs that are located between STA.25 and STA.30 (with STA.00 being at Nalaikh) have seasonal flows during summer season. Zadgai Us Spring is known to be the primary drinking water source for a nearby herder household, as shown in Figure 17 and details are provided in Table 21.

**Figure 17: Zadgai Us Spring**

Source: DEIA Team

<sup>11</sup> <https://marine.rutgers.edu/~cfree/watersheds-of-mongolia/>



**Table 21: Location of Springs (all in Tuv aimag)**

No.	x	y	Alt (m)	Current condition	Distance from road (m)	Soum, Bagh
1	679842	5261959	1551	Zadgai Us Spring. This spring has a good flow and is in good condition (sample taken)	426	Sergelen, Bayanburd
2	677324	5270654	1668	This spring has seasonal flow which is fed by precipitation during the summer time. No flow during the survey.	265	Sergelen, Bayanburd
3	674342	5271475	1680	This spring has seasonal flow which is fed by precipitation during the summer time. No flow during the survey.	721	Sergelen, Bayanburd
4	671224	5273865	1699	This spring was frozen during the field survey.	110	Sergelen, Bayanburd
5	671434	5273099	1685	No flow during the survey. However, it was registered on the regional map.	893	Sergelen, Bayanburd






Source: DEIA Team.

73. A total of 55 ground water wells are identified along the road corridor with the furthest away from the corridor being 2.2 km. Photographs of each well are recorded in the DEIA along with the following location details; Table 22 shows the locations of seven well which are within 100 m of the road corridor.

**Table 22: Location of Groundwater Wells**

No		Latitude	Longitude	Elevation, m	Distance from the road right-of-way (assume driving toward south)	Administration unit
1		298402	5137058	1259	40m on right side	Sumber soum, 1 <sup>st</sup> bag
2		298463	5136843	1256	78m on right side	Sumber soum, 1 <sup>st</sup> bag



3		298371	5137514	1270	64m on right side	Sumber soum, 1 <sup>st</sup> bag
15		291867	5160859	1263	98m on left side	Bayantal soum , 2d bag
25		707324	5203298	1326	73m on right side	Bayan soum, Uguumur bag
26		700762	5213752	1352	92m on right side	Bayan soum, Uguumur bag
51		668200	5275833	1609	52m on right side	Sergelen soum, Bayanburd bag

Source: DEIA Team.

74. **Output 1b (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 18. The project road crosses rivers at three locations as shown in Figure 19. The locations are: Shariin Gol river crossing 49°45'25.16"N 106° 9'59.80"E

- (i) Yeruu river crossing 49°52'43.93"N 106°14'36.52"E and
- (ii) Orhon river crossing 50°13'21.02"N 106°12'32.47"E

75. Table 23 gives data on the key water bodies in the vicinity of Output 1b. 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 23 Output 1b Surface Water Bodies Data**

River	Length km	Basin Size km <sup>2</sup>	Flow Rate m <sup>3</sup> /sec	Comment
Orkhon river	1,149 km	131,635 km <sup>2</sup>	-	Tributary to Selenge river
Kharaa river	353 km	14,388 km <sup>2</sup>	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 <sup>2</sup>	1.65	

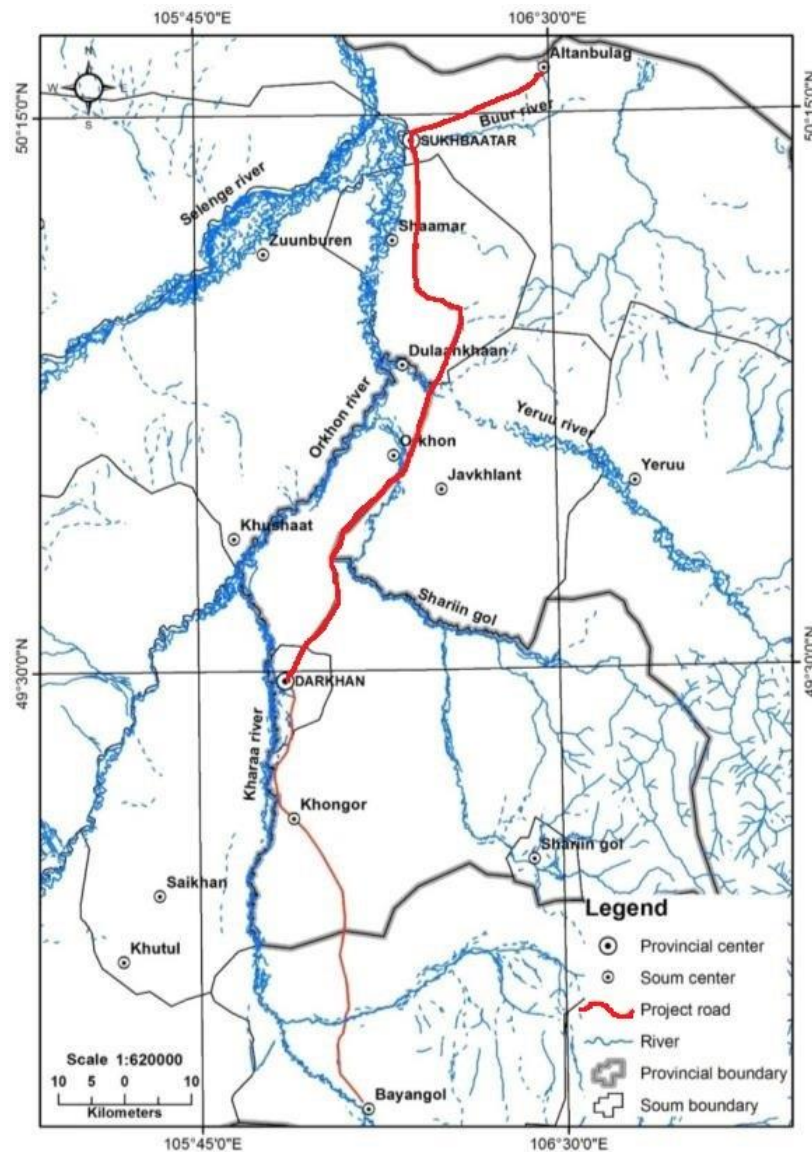
Source: DEIA Team

76. Approximately 56-75% of the total water flow for the rivers in Table 23 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 m<sup>3</sup>/sec. The highest registered flow for the Yeruu river reached 1290 m<sup>3</sup>/sec during the 1973 flood period.

**Figure 18: Shariin Gol Lake Location**

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

Figure 19: Output 1b Surface Water Bodies



Source: DEIA Team.

77. Hydrology and Flooding. Approximately 56-75% of the total water flow for the rivers in Table 23 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.

78. The highest flood flow registered for Kharaa river occurred in 1973 when the flow reached 722 m<sup>3</sup>/sec. The highest registered flow for the Yeru river reached 1290 m<sup>3</sup>/sec during the 1973 flood period. For Orkhon river, during significant floods, registered flood flow was between 500-1750 m<sup>3</sup>/sec.

79. The DEIA survey team sampled<sup>12</sup> **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 3) is exceeded.

**Table 24 Kharaa River Water Quality Analysis**

Anion	Per Litre			Cation	Per litre		
	Mg	mg-equivalent	mg-equivalent%		mg	mg-equivalent	mg-equivalent%
Cl-	16.0	0.45	12.51	Na++K+	12.6	0.55	15.21
SO4--	5.0	0.10	2.90	Ca++	37.1	1.85	51.43
NO2-	0.5	0.01	0.30	Mg++	14.6	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-	183.0	3.00	83.40	Fe+++	0.0	0.00	0.00
Дүн	206.5	3.60	100.0	Дүн	64.3	3.60	100.0
Hardness was 3.05 mg-equi/dm3 an EC was 319 µS/sm.							

Source: DEIA Team.

**Table 25 Shariin Gol Water Quality Analysis**

Anion	Per litre			Cation	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
Дүн	252.0	4.31	100.0	Дүн	81.3	4.31	100.0
Hardness was 2.80 mg-equi/dm3, EC=414 µS/sm							

Source: DEIA Team

**Table 26 Yeruu River Water Quality Analysis**

Anion	Per litre			Cation	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
Дүн	146.0	2.54	100.0	Дүн	49.9	2.54	100.0
Hardness was 1.55 mg-equi/dm3, EC=185 µS/sm							

Source: DEIA Team.

<sup>12</sup> Analysis undertaken at the laboratory of the Geo-ecological institute of Mongolia

**Table 27 Hiagt River Water Quality Analysis**

Anion	Per litre			Cation	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
ДүН	413.4	7.31	100.0	ДүН	141.8	7.31	100.0
Hardness was 4.90 mg-equi/dm3, EC=722 µS/sm							

Source: DEIA Team.

**E. Permafrost**

80. 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.

81. In terms of the project road,

- (i) Output 1a (Choir-Nalaikh corridor) is in subzone No. 3 along the majority of the road, and subzone No. 2 at the northernmost end, indicating that along the majority of the corridor, permafrost is a rare occurrence with potential scattered permafrost spots towards the north approaching Nalaikh.
- (ii) Output 1b (Darkhan-Altanbulag corridor) is in subzone No.3, indicating that permafrost is a rare occurrence.

82. The ADB PPTA team visited the project sites and confirmed that there was no sign of permafrost on the existing project road corridors.

**F. Air Quality**

83. 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.

84. Output 1a (Choir-Nalaikh corridor). The DEIA team measured air quality at six locations along the corridor, for 30 minutes. The measurements were taken in April, which is typically a windy month in Mongolia. The results are shown in Table 28.

Table 28 Air Quality Choir-Nalaikh Corridor

No	Elevation	Location	SO <sub>2</sub> , mg/m <sup>3</sup>	NO <sub>2</sub> , mg/m <sup>3</sup>	Dust level /PM10, mg/m <sup>3</sup>
1	04.14	STA.00	0.059	0.297	0.108
2	04.14	In Sergelen <i>soum</i> territory	0.043	0.022	0.010
3	04.14	Nearby Bagakhangai town	0.028	0.013	0.039
4	04.14	Nearby Bayan <i>soum</i> center	0.030	0.036	0.019
5	04.14	Nearby Sumber <i>soum</i> center	0.044	0.049	0.011
6	04.14	In Bayantal <i>soum</i> territory	0.024	0.017	0.012
<b>Mongolian Air quality Standard MNS 4585:2016 (max. 24hr mean)</b>			<b>0.450</b>	<b>0.200</b>	<b>0.100</b>
Note: = exceeds standard					

Source: DEIA draft (2017).

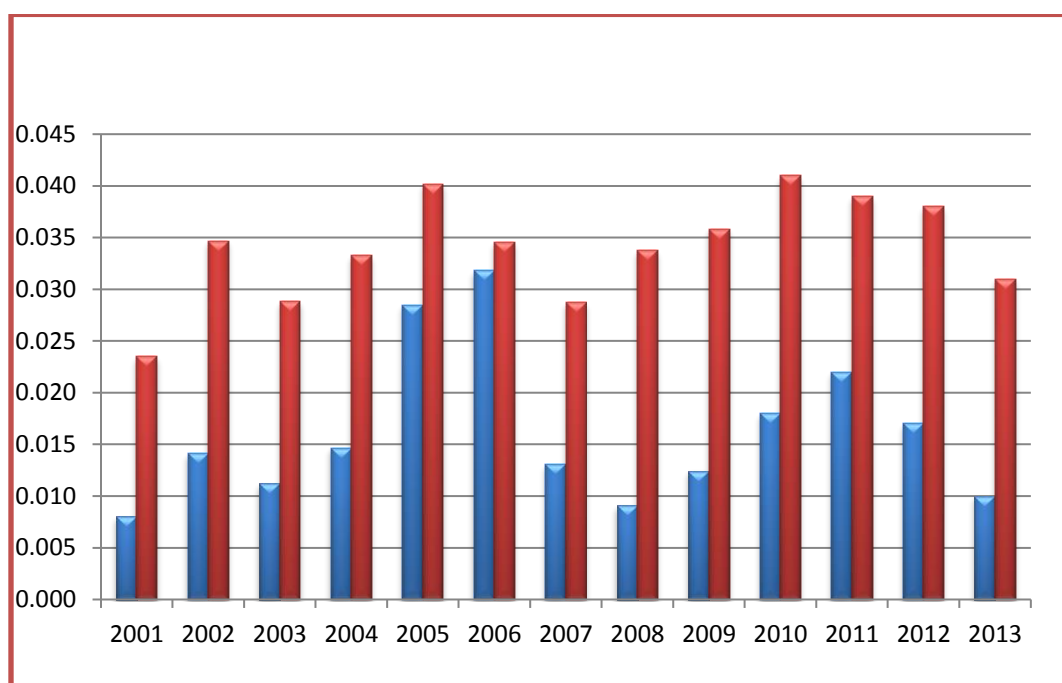
85. All measured parameters were within the Mongolian Air Quality standard level except the Nalaikh *soum* NO<sub>2</sub> which considered to be caused by heavy traffic surrounding Nalaikh town.

86. **Output 1b (Darkhan-Altanbulag corridor).** Dust measurements undertaken in April are shown in Table 30. The table shows that 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. Note that the DEIA draft does not state if the data are measured over a 24 hour average in order to make the data comparable to the standard.

Table 29 Air Quality Darkhan- Altanbulag Corridor

No.	Location & STA	PM 2.5 mg/m <sup>3</sup>		PM 10 mg/m <sup>3</sup>	
		Max	Min	Max	Max
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			

87. The most comprehensive air quality data for the Output 1b 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<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) in Darkhan.

**Figure 20: Air Quality Data Annual Average, Darkhan, mg/m<sup>3</sup>**

Note: Red bars indicate NO<sub>2</sub> and Blue bars indicate SO<sub>2</sub>.

Source: Environ LLC. Detailed EIA found in ADB (2014) IEE, Darkhan Wastewater Improvement Project

88. Additional data (Table 30) indicates that air quality met the national air quality standards and meets the WHO standards for 24 hour mean of SO<sub>2</sub> (0.02 mg/m<sup>3</sup>) and NO<sub>2</sub> (0.04 mg/m<sup>3</sup>) in 2013.

**Table 30: SO<sub>2</sub>, NO<sub>2</sub>, and Dust, Darkhan**

Parameter	Sulfur dioxide SO <sub>2</sub>	Nitrogen dioxide NO <sub>2</sub>	Dust
Average	0.003	0.024	0.053
Mongolian Standard 24 hr Mean	0.020	0.040	0.15
Units	mg/m <sup>3</sup>	mg/m <sup>3</sup>	mg/m <sup>3</sup>

Note: September 2013 data.

Source: Meteorological Institute of Darkhan found in ADB (2014) IEE, Darkhan Wastewater Improvement Project.

89. The data in Table 30 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 20 are higher, particularly for SO<sub>2</sub>, 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

90. 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 to inform this study, however where data are available, they are presented below.

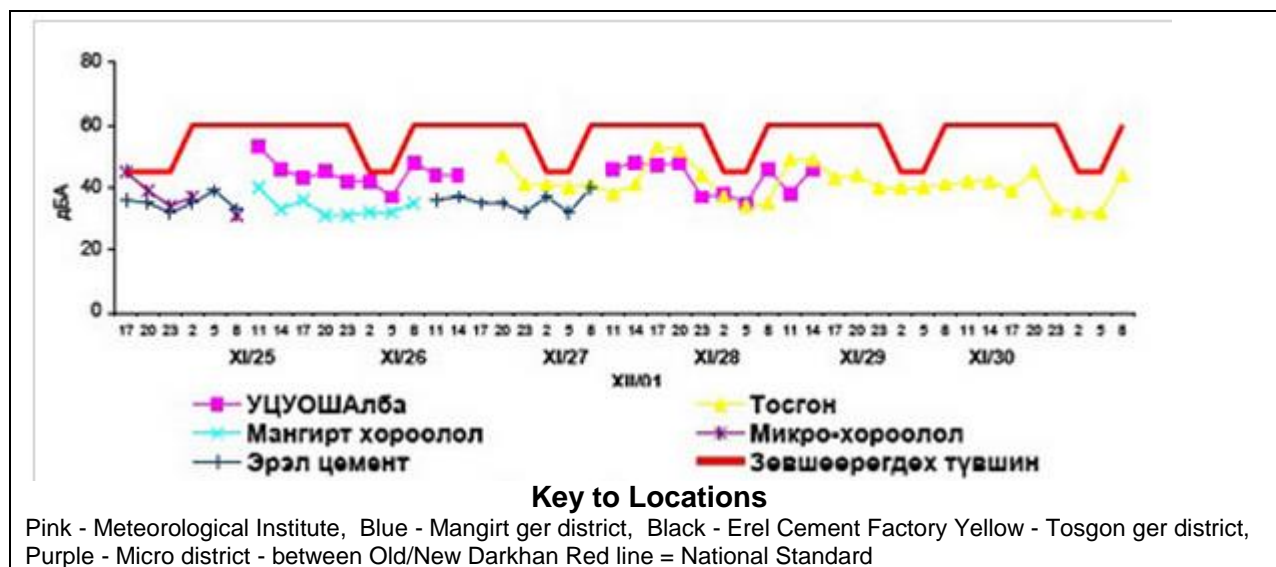
91. Output 1b (Darkhan-Altanbulag corridor). Noise monitoring data are provided in Table 33 below.

**Table 31: 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 average				

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

Figure 21: Darkhan soum Noise Monitoring Data



Source: National Committee on Reducing Air Pollution<sup>13</sup>

## H. Natural Disasters

93. 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.

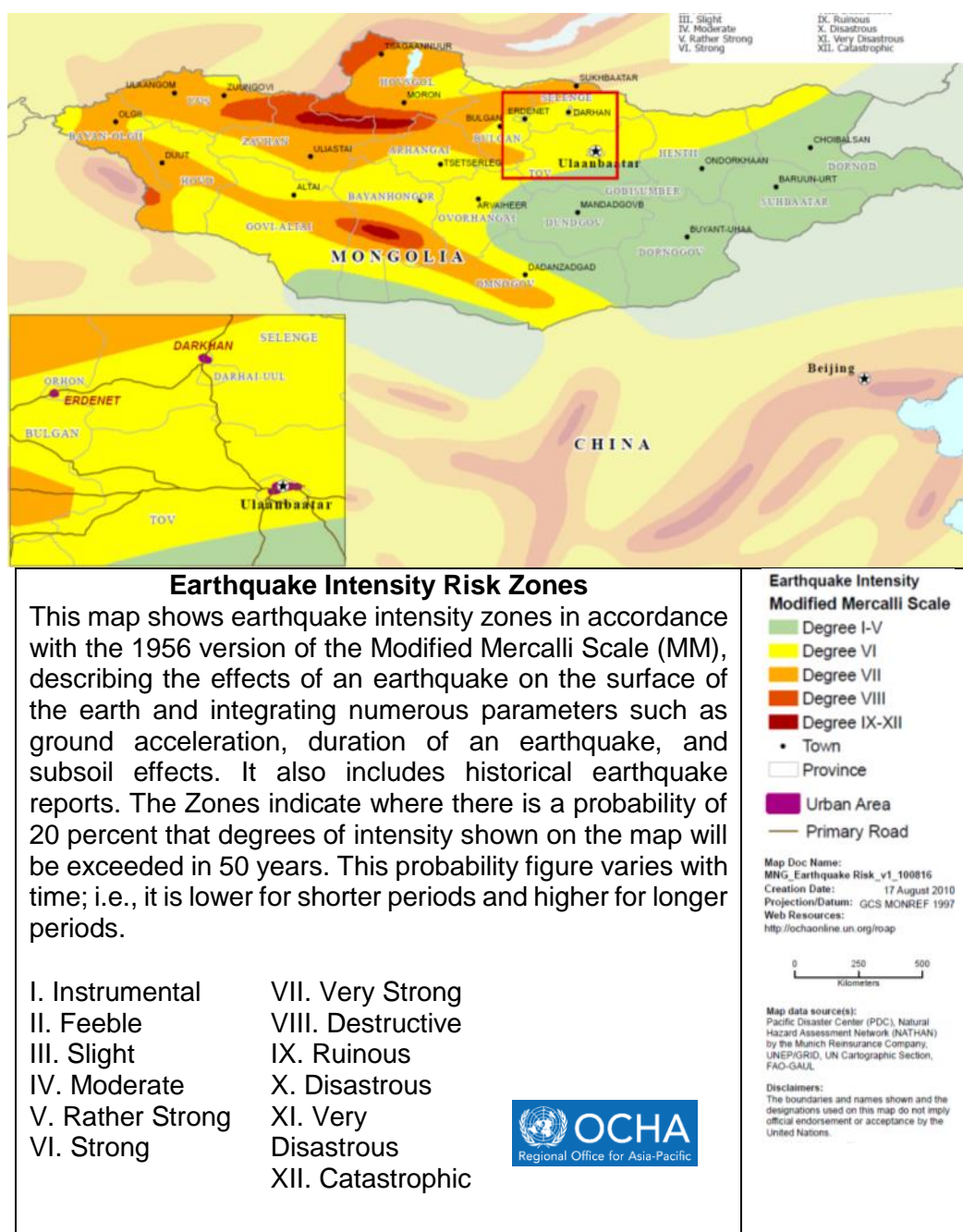
94. **Earthquakes.** Figure 22 illustrates seismic hazard in terms of macroseismic intensity, using the Modified Mercalli Scale; an alternative hazard metric to the older peak ground acceleration measure. Intensity is a generic bounded damage scale used to relate observed (or expected/forecasted) damage to the earth and built environment directly to earthquake 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. Figure 22 shows Output 1a to be in an area of low earthquake intensity risk and Output 1b in an area of stronger earthquake intensity risk.

95.

<sup>13</sup> <http://air.president.mn/en/>



**Figure 22: Earthquake Risk: Modified Mercalli Scale (Mongolia) Created 17 August 2010**



Source: [http://www.preventionweb.net/files/15692\\_mngearthquakeriskv1100816.pdf](http://www.preventionweb.net/files/15692_mngearthquakeriskv1100816.pdf)





## **I. Physical Cultural Resources**

96. The DEIA team confirmed that no physical cultural resources are present within the Darkhan-Altanbulag (output 1b) road corridor. However there are a number of locations along the Choir-Nalaikh corridor (output 1a) where cultural resources are present.

97. The DEIA team undertook an assessment of cultural heritage resources within 1 km of the corridors. Archaeological finds were noted within as shown in Table 32. The DEIA team state that

the tombs have been affected by recent human activity like movement of herders and animal grazing or wind erosion. Prior to project implementation, the PIU Environment Officer will inform the Archeological Institute of Mongolia about the sites to determine whether a more detailed professional investigation is needed and/or additional protection measures to be implemented.

**Table 32: Archaeological Finds Output 1b**

Archaeology	Location Co-ordinates	Distance to road	Photograph
Tomb at Ikh Oortsog STA.134	N 46° 47' 01,1" E 107° 55' 30.0" Alt 1271 m	700m	
Tomb nearby Bayan Hutul STA 13	N 47° 40'17,19" E 107° 14'08.17" Alt 1570 m	100m	
Tomb at Bayantal (1) STA.173	N 46° 29' 44,68" E 108 20' 45.68" Alt 1308m	700m	
Tomb near Bayantal (2) STA.173	N 46° 29' 42,11" E 108 20' 45.55" Alt. 1305m	700m	

Source: DEIA draft (2017)

## J. Ecological Resources

### 3. Output 1a (Choir-Nalaikh corridor)

98. **Flora.** The DEIA team conducted a flora survey along the Nalaikh-Choir road corridor. The survey included 29 specific locations at which plant species were recorded. The survey identified 29 plant species of 14 plant families. None were included in the Mongolian Red Book or have any international species. The flora is dominated by perennial grasses, with occasional shrub species.

99. **Fauna.** The DEIA survey team identified 19 species of bird and 6 species of mammals, see Table 33 and Table 34 respectively. The dominant bird species included those from duck and song bird families. The mammals include a sighting of the near threatened corsac fox (*Vulpes corsac*) and the endangered Mongolian gazelle (*Procapra gutturosa*).

**Table 33. Bird species surveyed**

Family	English name	Latin name	Mongolian name	Protection Status	
				Regional level	Global level
<b>Anatidae - Нугасныханы овог</b>	Goose	<i>Anser sp.</i>	Галуу	LC	LC
	Ruddy Shelduck	<i>Tadorna ferrugenia</i>	Ангир, Хондон ангир	LC	LC
	Mallard	<i>Anus platyrhynchos</i>	Зэрлэг нугас	LC	LC
	Eurasian Teal	<i>Anus crecca</i>	Ногоохон нугас	LC	LC
<b>Falconidae - Шонхорынхоны овог</b>	Falcon	<i>Falco sp.</i>	Шонхор		
<b>Accipitridae - Харцгайнханы овог</b>	Upland Buzzard	<i>Buteo hemilasius</i>	Шилийн сар	LC	LC
	Black Kite	<i>Milvus migrans</i>	Сохор элээ	NA	LC
<b>Columbidae - Тагтааныханы овог</b>	Rock Pigeon	<i>Columba livia</i>	Хөхвөр тагтаа	LC	LC
<b>Alaudidae - Болжморынхоны овог</b>	Asian Short-toed Lark	<i>Calandrella cheleensis</i>	Дэрсний бялзуумар	LC	LC
	Horned Lark	<i>Eremophila alpestris</i>	Шоорон алаг болжмор	LC	LC
	Mongolian Lark	<i>Melanocorypha mongolica</i>	Монгол болжмор	LC	LC
<b>Motacillidae - Харагчныханы овог</b>	White wagtail	<i>Motacilla alba</i>	Хөх цэгцгий	LC	LC
<b>Corvidae - Хэрээнийхэний овог</b>	Black-billed Magpie	<i>Pica pica</i>	Шаазгай	LC	LC
	Carrion Crow	<i>Corvus corone</i>	Хар хэрээ (Алаг хэрээ)	LC	LC

Family	English name	Latin name	Mongolian name	Protection Status	
				Regional level	Global level
<b>Turdidae - Хөөндийхэний овог</b>	Common Raven	<i>Corvus corax</i>	Хон хэрээ	LC	LC
	Isabelline Wheatear	<i>Oenanthe isabellina</i>	Бүжимч чогчоохой	LC	LC
	Pied Wheatear	<i>Oenanthe pleschanka</i>	Мяраан чогчоохой	LC	LC
	House Sparrow	<i>Passer domesticus</i>	Оронгийн бор шувуу	LC	LC
<b>Ploceidae - Бор шувууныханы овог</b>	Eurasian Tree Sparrow	<i>Passer montanus</i>	Хээрийн бор шувуу	LC	LC
	Bunting	<i>Emberiza sp.</i>	Хөмрөг	LC	LC
<b>LC = Least Concern status</b>					

Source: DEIA draft (2017).

**Table 34 Mammal Species Surveyed**

Family	English name	Latin name	Mongolian name	Protection status	
				Regional level	Global level
<b>Leporidae - Туулайнхан овог</b>	Tolai Hare	<i>Lepus tolai</i>	Боролзой туулай	LC	NA
<b>Sciuridae - Хэрмийнхэн овог</b>	Long-tailed (Siberian) Souslik	<i>Spermophilus undulatus</i>	Урт сүүлт зурам	LC	LC
<b>Cricetidae - Шишгийнхэн овог</b>	Mongolian Gerbil	<i>Meriones unguiculatus</i>	Монгол чичүүл	LC	LC
	Brandt's Vole	<i>Lasiopodomys brandtii</i>	Цайвар үлийч	LC	LC
<b>Carnivores - Махчтан</b>	Corsac fox	<i>Vulpes corsac</i>	Хярс үнэг	NT	LC
<b>Bovidae - Тугалмайтныхан овог</b>	Mongolian gazelle	<i>Procarpa gutturosa</i>	Цагаан зээр	EN	LC
<b>NT – Near Threatened, LC – Least Concern, EN - Endangered</b>					

Source: DEIA draft (2017).

#### 4. Output 1b (Darkhan-Altanbulag corridor)

100. **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

101. Table 35.

102. No rare plant species were found during the survey. The vegetation comprised trees including pine and larch, and a range of common grasses and flowering plants. Figure 23 shows typical area of pine trees along the corridor (survey location No. 11).

**Table 35 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 ( <i>Pinus sylvestris</i> L.) "Tujiin Nars" nearby Sukhbaatar town		

**Figure 23. 'Tujiin Nars' pine forest area**

103. The DEIA team noted five specific locations where trees encroach onto the right of way, causing potential road safety issues, these are given in Table 36.



**Table 36 Locations of Tree Encroachment**

Location	Photograph
Two trees are on the right side of the road at STA.237	
Stands of trees on both sides of the road between STA.258 and STA.259.	
There are trees on both sides of the road STA.276, close to Yeruu river bridge (400-500m) N 49°52'50.5"; E 106°14'39.6"	
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°01'34.7"; 106°12'54.6"; To: 50°06'41.4"; 106°13'05.2"	
There are trees close to the road nearby the entrance point of Sukhbaatar town. From: N 50°12'44.5"; E 106°12'23.4"; To: N 50°12'28.4"; E 106°13'03.1"	

Source: DEIA draft (2017).



110. **Employment and industry.** In Nalaikh district in 2017, 328 people were registered unemployed, compared to 833 in 2016. Industrial sectors include coal mining and electricity and thermal power production. Other industrial sectors include construction materials production and brick products.

111. In Sergelen Soum, the over 70% of the households are herders, thus not resident in the soum centre all year. The soum has over 140,000 head of livestock including camels, goat, sheep, cattle and horses. 18 people are registered unemployed. The soum's key economic activity is gold mining, 17 registered organizations extracting gold. Other enterprises include a new airport in Hushigt valley, a 50kW wind park, a cement factory and construction material producers.

112. Industry in Bagakhangai district is centered on a meat processing factory which is essential to the food supply of Ulaanbaatar. The plant produces 900 tons of processed meat products per day and was built with foreign investment, opening in 1994.

113. Bayan soum has 43 unemployed persons registered, which is an increase of 2.6 times on the previous year. The soum has over 50,000 head of livestock indicating that the population are primarily herders.; fodder production was 134 tons in 2016 which is a 17% decrease from 2015

114. Bayantal soum is in a relatively new province; Govisumber aimag was established in 1994 in order to help develop the Choir city. Prior to that, Govisumber province was a part of Dornogobi aimag. The soum has over 42,000 head of livestock and includes 142 herder households, equating to 40% of the population.

115. Sumber soum is the Choir town soum and is considered one of the most important railway hubs in Mongolia. It has rapid population growth and the population is projected to reach 30,000 by 2025; there is significant in-migration from rural areas. In 2016, 238 people were registered unemployed. A significant employer in the soum is Shivee Ovoo coal mine, producing brown coal for the Ulaanbataar market. Its turnover in 2016 was 45 billion MNT, which is a 26% increase compared to 2015. Shivee Ovoo JSC comprises of 96% of the total industrial output in the Govisumber province.

116. In addition to mining, the soum includes 2449 herders in 1055 herder households and as such includes nearly 40,000 heads of livestock. This equates to nearly 20% of the population being registered as herders. The soum categorizes 86% of its land use as agricultural.

117. Traffic Accidents. Since 2010, Bagakhangai district has recorded 71 road traffic accidents, from which seven fatalities are recorded.

## **6. Output 1b (Darkhan-Altanbulag corridor)**

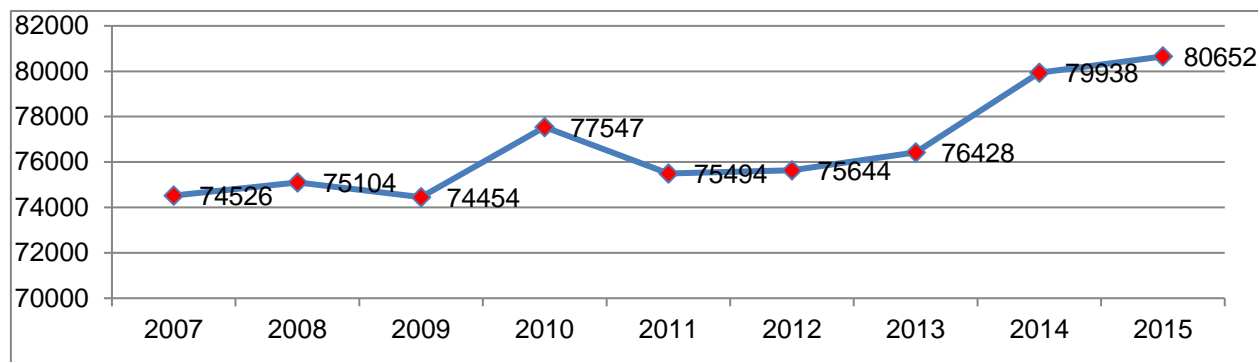
118. Darkhan city is the provincial centre of Darkhan-Uul province. Over 80% of the province's population live in Darkhan which has 76,428 permanent residents. The soum has 18 bags and 23,241 households. The population of Darkhan has been steadily rising since a dip in 2011. See Figure 24. Population 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.<sup>14</sup>

119. 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).

120. **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.

121. 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.

122. 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<sup>15</sup>.

123. **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

<sup>14</sup> Mongolia Human Development Report 2011: From Vulnerability to Sustainability, UNDP, Ulaanbaatar, 2011.

<sup>15</sup> Sigel K. (2010) Environmental sanitation in peri-urban ger areas in the city of Darkhan (Mongolia): A description of current status, practices, and perceptions

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.<sup>16</sup>

124. **Connectivity.** Darkhan soum has a well developed infrastructure. The Ulanbaataar-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

125. 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).

126. 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.

### B. Impacts Associated with Project Location, Planning and Design

127. **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 I), the PIU Environmental Officer will assume overall responsibility

<sup>16</sup> ADB. IEE Darkhan Wastewater Management Improvement Project, Nov. 2014

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

128. **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<sub>x</sub>) and sulfur oxides (SO<sub>x</sub>) 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 (VOC) and poly-aromatic hydrocarbons (PAH);
- (iii) Fugitive dust from borrow pits; and
- (iv) Fugitive dust from loading, unloading and haulage of construction materials.

129. 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.

130. **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.

131. 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.

132. **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.

133. **Noise.** Road routine maintenance works do not involved 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 38 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 PPE.

**Table 38 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.

134. 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.

135. 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.

136. **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.

137. 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 removal from the existing road right-of-way and road drainage area and relocating them with aftercare will be arranged and carried out through close coordination with and approval from Environment Department of Selenge aimag. The plan will be in accordance with Mongolia's Forest Law if required.

138. **Surface and Groundwater.** There are several wells in the existing road corridors at Output 1a (Choir-Nalaikh corridor). To mitigate any potential impacts on water, demarcation of all wells within 100m of the road will be installed using high visibility markings and a sign. The demarcation will be confirmed with the necessary soum authorities like Sumber soum, Bayantal soum, Bayan soum and Sergelen soum.

139. 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.

140. 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.

141. **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 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.
- (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.

142. **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.

143. **Cultural Heritage.** Nearby the existing road corridors, there are several cultural sites identified: Suld Ovoo in Choir-Nalaikh corridor, 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:

- (i) Demarcate the Ovoo with high visibility tape and a sign through close coordination with Bayantal *soum*
- (ii) 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

#### **D. Environmental Impact and Mitigation Measures Post Construction**

144. 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 negative impacts are anticipated which result from the project. 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.

145. **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 greenhouse gases associated primarily with

transportation and the use of materials.

## VI. INFORMATION DISCLOSURE AND PUBLIC CONSULTATIONS

### A. Public Consultations during Project Preparation

146. 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.

147. **Output 1a (Choir-Nalaikh corridor) Area.** The DEIA team conducted initial consultation through meetings with administration staff, *soum* government staff and a questionnaire based survey among 130 local residents. *Soum* governors were consulted in Bayan *soum*, Bayantal *soum*, Sumber *soum*, Nalaikh town and Govisumber *aimag*. The participants are categorized as shown in Table 39.

**Table 39 Survey Participants**

Category	Participants
Gender	Unknown
Location of residence to project road	33% within 250m
	6% within 250-500m
	17% within 500-800m
	44% within 800-1000m
Occupations	27% state entities
	21% private entities
	35% herders
	17% other employment

Source: DEIA team.

148. The survey responses are shown in Table 40.

**Table 40 Survey Responses**

Question	Response
1. What's the most key environmental issue in your place of living?	Sumber <i>soum</i> : 50% said dust and air pollution in the <i>soum</i> center during winter season. Other responses were lack of green areas, physical pollution due to waste disposal.
2. Potential concerning issues that arise from road rehabilitation works?	60% - no any major issues. 25% - dust emission. Other responses were: livestock crossings, road signage and waste disposal
3. What's your opinion on road rehabilitation works coming?	98% will support the project 2 % do not know
4. Recent natural disasters?	55% -none 30% - dzud Other responses - dust storms in spring
5. Positive impacts of improved road on your livelihood?	50% - less traffic accidents 15% - good for local economy 20% -don't know
6. Traffic accidents?	90% - traffic accidents happen in their <i>soums</i> (on the Nalaikh-Choir road) 10% - no traffic accidents.

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The key reasons for traffic accidents cited were: road damage at some points, passenger cars drive too fast

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Source: DEIA team.

149. The key views expressed during meetings are as follows:

- (i) Most of the survey participants consider the road has deteriorated due to increased traffic of heavy duty vehicles during the past 3 years.
- (ii) Participants recommend that the government prohibits heavy vehicles (over 40 tons)
- (iii) *Soum* administration staff requested that additional warning signage be erected at the traffic accident black spots.
- (iv) Local residents consider dust as the most concerning issue during the road rehabilitation. The road will be closed during the rehabilitation works which cause the passengers to drive on dirt roads.
- (v) There are no serious natural disasters mentioned in the road corridor however the Nalaikh-Choir road was blocked by heavy snow in 2010 and 2016.

150. **Output 1b (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

151. **Survey Participants.** 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 41.

**Table 41 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

152. The questionnaire based survey included seven questions; the answers for each question are summarized in Table 42.



**Table 42 Survey Responses**

<b>Question</b>	<b>Response</b>
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 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.

153. 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.

## **B. Public Consultations during Project Implementation**

154. 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.

155. 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. A sample Environmental Monitoring Interview Form is in Appendix 4.

## **C. Information Disclosure**

156. 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](http://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](http://www.adb.org).

## VII. GRIEVANCE REDRESS MECHANISM

### A. GRM Objective

157. 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

158. 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.

159. 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.

160. The PIU 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.

161. 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

162. Procedures and timeframes for the grievance redress process are as follows and shown in Figure 25.

- (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 PCU and PIU.
- (ii) **Stage 2: Official Complaint to PCU.** If the AP is not satisfied with the actions by the contractor, the AP will make his/her complaint to the *bagh* or *soum level PCU*.

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, the PIU and PCU will investigate and resolve the issue within 14 working days.

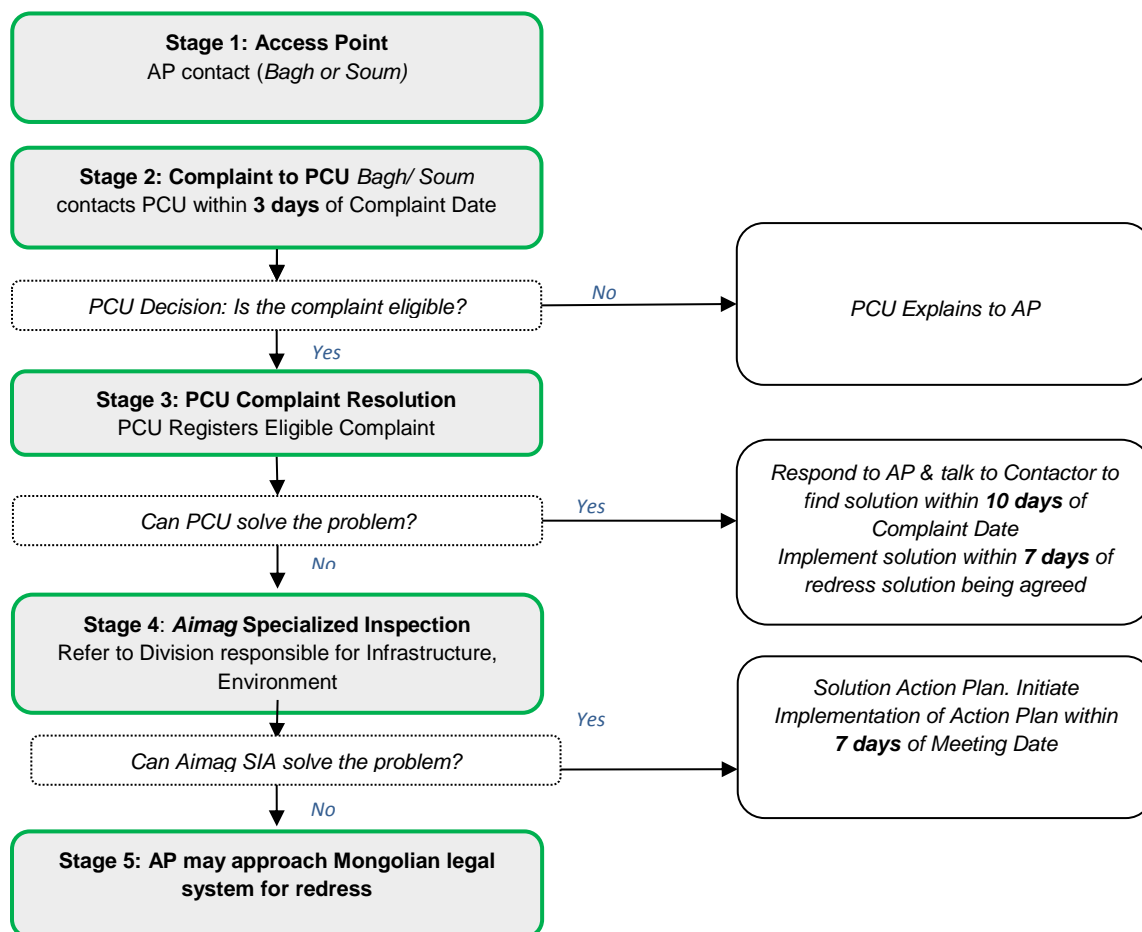
- (iii) **Stage 3: Stakeholder Meeting:** If no solution can be identified by the PIU and PCU or if the AP is not satisfied with the suggested solution under Stage 3, within 14 days, the PCU together with the PIU will organize a multi-stakeholder meeting under the auspices of the head or the representative 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;

163. **Stage 5: Special consultation meeting with the EA, ADB, and relevant authorities, including Aimag Specialized Inspection Agency (ASIA).**<sup>17</sup> 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 meetings within 21 days with the AP, the EA, ADB, and other relevant authorities including Aimag Specialized Inspection Agency to find appropriate solutions. The agreed solution shall be implemented withing 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.

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<sup>17</sup> A specific division within the organization is responsible for Infrastructure, Environment and Mining inspection.

Figure 25: Proposed Project GRM



AP = affected persons; PCU = project complaint unit; SIA = social impact assessment.

## **VIII. CONCLUSIONS**

### **A. Major Environmental Impacts and Mitigation Measures**

164. The principal impacts during the design phase are associated with the planned removal of trees, particularly from the pine forest area along the Output 1b corridor, where trees encroach into the right of way and reduce traffic safety. During the construction phase, there will be impacts in both corridors 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.

165. 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.

166. 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; the pathway will be removed. For the remaining impacts which cannot be avoided, the mitigation measures seek to minimize them to acceptable levels.

167. 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**

168. 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.

## 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 A1.1.

**Table A1.1: Implementing Organizations**

General Role & Responsibilities	Role in Environmental Safeguards
<b>Ministry of Road Transport Development (MRTD)</b>	
<ul style="list-style-type: none"> <li>• Executing agency (EA)</li> <li>• Establishes and chairs a Project Steering Committee (PSC)</li> <li>• Establishes a Project Implementation Unit (PIU)</li> </ul>	Overall responsibility for ensuring environmental safeguard are implemented
<b>Project Steering Committee (PSC)</b>	
<ul style="list-style-type: none"> <li>• Chaired by Director General, MRTD</li> <li>• Provides project oversight</li> <li>• Includes representatives of the MRTD, Ministry of Finance,</li> </ul>	Support and specific advice to EA on specific safeguard issues if needed
<b>Project Implementation Unit (PIU)</b>	
<ul style="list-style-type: none"> <li>• Implementing Agency (IA)</li> <li>• Reports to EA</li> <li>• Project implementation and supervision</li> <li>• Preparing and submission of implementation reports to ADB</li> <li>• PIU staff to include part-time Environmental Monitoring Consultant</li> </ul>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Implementing and supervising EMP and other safeguard plans</li> <li>3. Provision of safeguard reports to EA</li> <li>4. Provision of specialist consultant to perform the function of PIU Environmental Officer</li> <li>5. Dissemination &amp; Implementation of Grievance Redress Mechanism (GRM)</li> </ol>
<b>PIU Environmental Officer (PIU EO)</b>	
<ul style="list-style-type: none"> <li>• EMP implementation, including monitoring and reporting</li> </ul>	<ol style="list-style-type: none"> <li>1. Ensure tender documents specify requirements of EMP</li> <li>2. Ensure that EMP considerations are incorporated in the detailed designs and included in civil works contracts</li> <li>3. Training for contractor/engineers in implementing EMPs</li> <li>4. Site inspections and progress reporting. EMP update after detail project design</li> <li>5. Input into Grievance Redress Mechanism (GRM)</li> <li>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)</li> </ol>
<b>Project Management Consultant (PMC)-Loan Implementation Environment Consultant (LIEC)</b>	
<ul style="list-style-type: none"> <li>• Implementation and capacity development consultancy support to PIU</li> </ul>	<ul style="list-style-type: none"> <li>Support safeguard issues as required</li> <li>Support PIU in preparing EMRs</li> </ul>
<b>Design and Construction Supervision Company(s)</b>	

<ul style="list-style-type: none"> <li>• Design of the maintenance in sections</li> <li>• Construction supervision</li> </ul>	Collaboration with PIU-EMS on final designs to ensure acceptable mitigation of environmental impacts
<b>Construction Companies</b>	
<ul style="list-style-type: none"> <li>• Completion of road sections as specified</li> <li>• Provision of Environmental Control Engineer</li> </ul>	<ol style="list-style-type: none"> <li>1. Environmental Control Engineer responsible for daily monitoring and supervision, and evaluation of mitigation measures' implementation</li> <li>2. Develop and implement construction site specific EMP (CEMP).</li> <li>3. Reporting on CEMP mitigation measure implementation</li> </ol>

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 43. Training Program**

<b>Training</b>	<b>Attendees</b>	<b>Contents</b>	<b>Times</b>	<b>Period (days)</b>	<b>No. of persons</b>	<b>Cost (\$/person /day)</b>	<b>Total Cost</b>
<b>Construction Phase</b>							
<b>ADB, Mongolia and International EHS standards, regulations and policies, including GRM</b>	PIU, contractors	<ul style="list-style-type: none"> <li>– ADB's safeguard policy statement</li> <li>– International environmental, health and safety management practice in civil construction</li> <li>– International environmental, health and safety management practice in civil construction</li> <li>– GRM structure, responsibilities, and timeframe</li> <li>Types of grievances and eligibility assessment</li> </ul>	Twice - once prior to, and once after one year of project implementation	1	20	100	\$2,000
<b>Implementation of EMP and EMoP, including construction EHS plans</b>	PIU, IA, contractors	<ul style="list-style-type: none"> <li>– Impacts and mitigation measures</li> <li>– Monitoring and auditing mechanism</li> <li>– Reporting requirements</li> <li>– Issue of non-compliance and corrective actions for EMP, EMoP and GRM.</li> </ul>	Twice - once prior to, and once after one year of project implementation	1	20	100	\$2,000
<b>Total estimated cost:</b>							<b>\$4,000</b>

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 47 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**

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.

5. Table 45 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); 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.

6. Table 46 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 44: Mitigation Measures**

Environmental Impact/Issue	Area of concern	Mitigation measures	Timeframe and frequency	Cost (\$)	Implemented by	Supervised by
<b>Pre-Construction Phase</b>						
Environmental Management System		<ul style="list-style-type: none"> <li>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.</li> </ul>	Before construction	Included in operational costs	PIU/Contract or/DCSC	PIU
		<ul style="list-style-type: none"> <li>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).</li> </ul>				

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- 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).

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**Construction Phase**


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Air Quality – Dust & Vehicle Emissions	Construction sites, borrow pits and stockpiling areas	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Water will be sprayed for construction sites, material handling areas, and borrow pits where fugitive dust is generated.</li> </ul>	Continuously during construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC
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	Both Outputs: Asphalt batching facilities	<ul style="list-style-type: none"> <li>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.</li> </ul>	Continuously during construction	Included in operational costs	Contractor	PIU EO, LIEC
	Construction vehicles and trucks	<ul style="list-style-type: none"> <li>Construction vehicles and machinery will be maintained to a high standard to minimize emissions.</li> <li>Trucks carrying stone chippings for surface dressing will be covered with tarpaulins or other suitable cover.</li> </ul>	Continuously during construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC
Soil erosion	Borrow areas	<ul style="list-style-type: none"> <li>Site specific borrow management plan will be developed and approved by relevant soum authority.</li> <li>A map of all borrow sites will be developed and maintained;</li> <li>Safety measures, if required, will be implemented to prevent access by members of the public and livestock;</li> <li>Measures for control of dust during extraction, handling and transport of materials; and</li> <li>Measures to rehabilitate the borrow sites include contouring of the slopes within each site and reseeded sites with native species.</li> </ul>	Continuous during borrow areas management and end of construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC
Solid waste management	Construction sites, construction camps, and	<ul style="list-style-type: none"> <li>The waste hierarchy to ensure efficient use and management of resources will be applied so that</li> </ul>	Continuous during construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC

	construction vehicle/driver's waste	<p>priority is to prevent waste at source as much as possible.</p> <ul style="list-style-type: none"> <li>• Effective management of materials on site through good house-keeping and work planning will be carried out.</li> <li>• Detail arrangements for storage and transportation of the waste to its disposal point will be made.</li> <li>• Hazardous waste, if any, will be handled and transported, and further disposed by a specialized agency with proper license.</li> <li>• 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.</li> <li>• Prohibit burning of waste at all times.</li> <li>• Provide all vehicles/drivers with plastic bags for waste collection and prevent any unauthorized waste disposal.</li> </ul>				
Noise	Both Outputs: All construction sites	<ul style="list-style-type: none"> <li>• Maintain all exhaust systems in good working order; undertake regular equipment maintenance;</li> <li>• 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;</li> <li>• Provide advance warning to the community on timing of noisy</li> </ul>	Continuous during construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC

		<p>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.</p> <ul style="list-style-type: none"> <li>• Ensure noise monitoring is undertaken near sensitive receptors, particularly dwellings when construction machinery is operational.</li> </ul>				
	Impacts on pasture land induced by borrow areas	<ul style="list-style-type: none"> <li>• Minimize the scale of borrow areas as much as possible</li> <li>• Restoration measures immediately after construction is completed.</li> </ul>	During construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC
Flora	Trees and shrubs encroached to road right-of-way	<ul style="list-style-type: none"> <li>• Tree removal from the existing road right-of-way and road drainage area and relocating them with aftercare will be arranged and carried out through close coordination with and approval from Environment Department of Selenge aimag</li> </ul>	During construction	Included in operational costs	Contractor/D CSC	PIU EO, LIEC, Selenge Aimag Env. Department
Surface and Groundwater Protection	Choir-Nalaikh corridor	<ul style="list-style-type: none"> <li>• Demarcation of all wells within 100m of the road will be installed using high visibility markings and a sign. The demarcation will be confirmed with the necessary soum authorities like Sumber soum, Bayantal soum, Bayan soum and Sergelen soum.</li> </ul>	Beginning of construction period	Included in Contractor operational costs	Contractor/D CSC	PIU EO, LIEC, Soum authorities
	Darkhan-Altanbulag corridor	<ul style="list-style-type: none"> <li>• Good construction management and practices will be carried out to ensure construction works do</li> </ul>	Beginning of construction period	Included in contractor operational costs	Contractor/D CSC	PIU EO, LIEC,

		<p>not encroach on the surface water.</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>	and during construction			
Occupational Health and Safety.	All construction sites	<ul style="list-style-type: none"> <li>• Train and ensure all construction workers to be aware of potential work hazards and risks.</li> <li>• 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.</li> <li>• Document and record any occupational accidents and incidents. Review the records and incorporate them into further training.</li> <li>• 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.</li> </ul>	Throughout construction	Included in contractor operational costs	Contractor/D CSC	PIU EO, LIEC,



Community Health and Safety	Settlements near all construction sites	<ul style="list-style-type: none"> <li>• 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.</li> <li>• All sites will be made secure through access control by installing fences and/or security personnel, whenever appropriate.</li> <li>• 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.</li> <li>• borrow pits will be managed to ensure unauthorized or accidental access to the sites by the public and livestock.</li> </ul>	Throughout construction	Included in contractor operational costs	Contractor/D CSC	PIU EO, LIEC,
Cultural Heritage	Suld Ovoo in Choir-Nalaikh corridor, the tomb at Bayan Hutual, 100m from the road in Darkhan-Altanbulag corridor.	<ul style="list-style-type: none"> <li>• Demarcate the Ovoo with high visibility tape and a sign through close coordination with Bayantal soum</li> <li>• 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</li> </ul>	Beginning of construction period	Included in contractor operational costs	Contractor/D CSC	PIU EO, LIEC, Soum authorities
<b>Operation Phase</b>						
N/A						

DCSC=Design and construction supervision company, LIEC=Loan implementation environment consultant PIU , EO=Project Implementation Unit Environment Officer.

Source: ADB PPTA team (2017).

**Table 45: EMP Monitoring**

<b>Monitoring parameters</b>	<b>Units</b>	<b>Frequency</b>	<b>Indicative Location</b>	<b>Scope of work</b>	<b>Corresponding standards</b>	<b>Maximum allowed level</b>
Dust level-TSP, PM10	mg/m <sup>3</sup>	Quarterly during construction season	<p>Six locations for each road corridor</p> <p>•At receptors within 100m of active construction work and borrow sites, contractors camp (if required).</p> <p>Receptors include housing areas, nomadic herder sites (if relevant) and businesses</p>	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 <sup>3</sup>
Noise level	dBA (1hr LAeq)	Quarterly during construction season	<p>Climbing lane construction sites</p> <p>•At receptors within 50m of active construction work.</p> <p>Receptors include housing areas, nomadic herder sites (if relevant) and businesses.</p>	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	Environmental Monitoring Report (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.		

**Table 46: Monitoring Budget**

<b>Monitoring parameters</b>	<b>Cost (\$ USD) –Per Year</b>
	<b>Output 1a</b>
Dust level-TSP, PM10	\$100x6 x 6 = \$3,600
	<b>Output 1b</b>
	\$100x2 x 6 = \$3,600
	<b>Output 1a</b>
Noise level	\$100x 6 x6 = \$3600
	<b>Output 1b</b>
	\$100x 6 x6 = \$3600
	<b>Output 1a</b>
Tree relocation & pasture replanting	\$1000
	<b>Output 1b</b>
	\$5000
	<b>Output 1a</b>
Health and Safety	\$5000
	<b>Output 1b</b>
	\$5000
EMP performance monitoring	PIU budget cost for PIU-EMS
<b>Total Costs</b>	<b>\$30,400</b>

## E. Reporting

7. 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 47 provides reporting requirements.

**Table 47: 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 month after construction completion	Final evaluation and assessment of EMP implementation	PIU/EA	ADB

## F. Mechanisms for Feedback and Adjustment

8. 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.

9. 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 Environment Officer, with support 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.

## FLORA SURVEY RESULTS

## Species recorded during field survey, Output 1a (Choir-Nalaikh corridor)

Family	English or Latin name	Mongolian name	Type
<b>Gramineae- Үетэний овог</b>	Lovely achnatherum	Гялгар дэрс	Perennial, grass
	Crested wheatgrass	Саман ерхөг	Perennial, grass
	Siberian wheatgrass	Сибирь хиаг	Perennial, grass
	Scabrous cleistogenes	Дэрвээн хазаар өвс	Perennial, grass
	Little lovegrass	Бага хургалж	Perennial, grass
	Green bristlegrass	Ногоон хоног будаа	Perennial, grass
	Awnless cleistogenes	Зүүнгарын хазаар өвс	Perennial, grass
	Siberian needle grass	Сибирь хялгана	Perennial, grass
	Gobian needle grass	Говийн хялгана	Perennial, grass
<b>Cyperaceae - Улалжийн овог</b>	Needle leaf sedge	Ширэг улалж	Perennial, grass
<b>Liliaceae- Сараанын овог</b>	Many-rooted onion	Таана	Perennial, grass
	Mongolian onion	Монгол сонгино, Хөмөл	Perennial, grass
	Thin-leaved onion	Турихан сонгинго	Perennial, grass
<b>Iridaceae- Цахилдагийн овог</b>	White-flowered iris	Цагаалин цахилдаг	Perennial, grass
<b>Urticaceae - Халгай овог</b>	Hemp-leaved nettle	Олслиг халгай	Perennial, grass
<b>Chenopodiaceae- Луулийн овог</b>	Lamb's quarters goosefoot	Цагаан лууль	Annual
	Common Russian-thistle	Толгодын бударгана	Annual
	Five-hooked bassia	Балуун манан-хамхаг	Annual
<b>Caryophyllaceae - Баширын овог</b>	Dry silene	Енисейн шээрэнгэ	Perennial, grass
<b>Rapaceae - Намуугийн овог</b>	White hornfennel	Цагаанлиг галуун тавар	Perennial, grass
<b>Brassicaceae - Тоонолжин цэцэгтэн</b>	Greyish-white ptilotridium	Буулалдуу янгиц	Shrub
<b>Rosaceae - Сарнайн овог</b>	Stemless cinquefoil	Навтуул гичгэнэ	Perennial, grass
	Bifurcate cinquefoil	Имт гичгэнэ	Perennial, grass
	Long-leaved burnet	Эмийн сөд	Perennial, grass
<b>Fabaceae - Буурцагтаны овог</b>	Little-leaved pea shrub	Бяцхан навчит харгана	Shrub
	White-barked bea shrub	Алтан харгана	Shrub
	Daurian Wildsenna	Дагуур тарваган шийр	Perennial, grass
<b>Rutaceae - Сүлүүгийн овог</b>	Daurian haplophyllum	Дагуур хүж өвс	Perennial, grass
<b>Convolvulaceae - Сэдэргэнийн овог</b>	Ammann glorybind	Аммань сэдэргэнэ	Perennial, grass
<b>Compositae - Нийлмэл цэцэгтэн</b>	Adamsia wormwood	Адамсын шарилж	Perennial, grass
	Fringed sagebrush	Агь шарилж	Shrub

**Species recorded during field survey, Output 1b (Darkhan-Altanbulag corridor)**

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

No.	Plant family	Scientific name of plant species	English name of plant species
43	Leguminosae Juss.	<i>Caragana microphylla</i> (Pall.) Lam.	Caragana
44		<i>Caragana stenophylla</i> Pojark.	Caragana versicolor
45		<i>Caragana pygmaea</i> (L.) DC.	Caragana pumila
46		<i>Astragalus galactites</i> Pall.	Milk vetch
47		<i>Astragalus mongolicus</i> Bunge.	Milk- vetch Mongol
48		<i>Oxytropis filiformis</i> DC.	Oxytropis
49		<i>Thermopsis dahurica</i> Czefr.	Thermopsis
50	Linaceae S.F.Gray	<i>Linum sibiricum</i> DC.	Flax
51	Umbelliferae Juss.	<i>Bupleurum scorzonrifolium</i> Willd.	Thorough-wax
52		<i>Bupleurum bicaule</i> Helm.	Thorough-grow
53	Primulaceae Vent.	<i>Androsace incana</i> Lam.	Rock-jasmine
54	Plumbaginaceae Juss.	<i>Goniolimon speciosum</i> (L.) Boiss.	Beauty Goniolmon
55	Convolvulaceae Juss.	<i>Convolvulus arvensis</i> L.	Cornbind
56	Boraginaceae Juss.	<i>Lappula intermedia</i> (Ldb.) M.Pop.	Stick-seed
57	Labiatae Juss.	<i>Thymus gobicus</i> Tschern.	Thyme
58		<i>Phlomis tuberosa</i> L.	Jerusalem-sage
59	Scrophulariaceae Juss.	<i>Veronica incana</i> L.	Silver speedwell
60		<i>Cymbaria dahurica</i> L.	
61	Plantaginaceae Juss.	<i>Plantago major</i> L.	Plantain
62	Rubiaceae Juss.	<i>Galium verum</i> L.	Bedstraw
63	Compositae Giseke.	<i>Heteropapus hispidus</i> (Thunbg.) Less.	Aster
64		<i>Artemisia dracunculus</i> L.	Estragon
65		<i>Artemisia pectinata</i> Pall.	Sage-brush
66		<i>Artemisia scoparia</i> Waldst.	Virgate wormwood
67		<i>Artemisia frigida</i> Willd.	Wormwood
68		<i>Artemisia adamsii</i> Bess.	Wormwood
69		<i>Artemisia commutata</i> Bess	Wormwood
70		<i>Artemisia tanacetifolia</i> L.	Wormwood
71		<i>Centaurea adpressa</i> Ledeb.	Centaury
72		<i>Cirsium setosum</i> (Willd.) Bieb	Creeping thistle
73		<i>Saussurea salicifolia</i> (L.) DC.	Saw-wort
74		<i>Taraxacum officinale</i> Wigg.	Dandelion

## 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 description 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 maintenance 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 must 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 description 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 are any additional impacts and mitigation measures identified, update the EMP accordingly.

12. **Conducting meaningful consultation.** As requirement to ADB SPS (2009), meaningful consultation with affected people needs to be organized and to 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 are 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 DEIA. 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 activities 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.

### **D. Rapid Environmental Assessment (REA) Form**

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

### Rapid Environmental Assessment (REA) Checklist

**Instructions:**

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

**Country/Project Title:**

**Sector Division:**


Screening Questions	Yes	No	Remarks
<b>A. Project Siting</b> Is the project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site			
▪ Protected Area			
▪ Wetland			
▪ Mangrove			
▪ Estuarine			
▪ Buffer zone of protected area			
▪ Special area for protecting biodiversity			
<b>B. Potential Environmental Impacts</b> Will the Project cause...			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?			
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?			
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?			

Screening Questions	Yes	No	Remarks
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?			
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?			
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?			
▪ noise and vibration due to blasting and other civil works?			
▪ dislocation or involuntary resettlement of people?			
▪ dislocation and compulsory resettlement of people living in right-of-way?			
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?			
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?			
▪ hazardous driving conditions where construction interferes with pre-existing roads?			
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?			
▪ creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?			
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?			
▪ increased noise and air pollution resulting from traffic volume?			
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?			
▪ social conflicts if workers from other regions or countries are hired?			
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?			

Screening Questions	Yes	No	Remarks
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?			
▪ community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.			

### A Checklist for Preliminary Climate Risk Screening

**Country/Project Title:**
**Sector:**
**Subsector:**
**Division/Department:**

Screening Questions		Score	Remarks <sup>18</sup>
<b>Location and Design of project</b>	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?		
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?		
<b>Materials and Maintenance</b>	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?		
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?		
<b>Performance of project outputs</b>	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?		

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

**Result of Initial Screening (Low, Medium, High):** \_\_\_\_\_

**Other Comments:** \_\_\_\_\_

**Prepared by:** \_\_\_\_\_

<sup>18</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

## ENVIRONMENTAL MONITORING INTERVIEW FORM

<b>Date of Interview:</b>		<b>Interviewer Name:</b>	
<b>Interview Site:</b> <i>Where is the interview held? In school, on the road, in shop</i>		<b>Stakeholder Name &amp; Status:</b> <i>Full name, status is business owner, school teacher, religious leader, resident</i>	
<b>Construction Site &amp; Date Construction Started</b> <i>Which road, GPS location if available</i>		<b>Has this stakeholder been interviewed before?</b> <i>Yes (when were they interviewed) No</i>	
<b>Interview Discussion Points</b>			
<b>1. Noise</b>		<b>Record of Discussion</b>	
<b>Before the project started, was the person disturbed by noise? If yes, explain how and when.</b> <i>Where did the noise come from? E.g. traffic, machinery, people, music</i> <i>When did it disturb the person? E.g. all day, at night, intermittently</i>			
<b>During the construction, is the person disturbed by noise from the project? If yes, explain how and when.</b> <i>What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers etc</i> <i>When did it disturb the person? E.g. all day, at night, intermittently</i>			
<b>If noise from construction is a problem, what changes does the person suggest are made?</b>			
<b>2. Air Quality</b>		<b>Record of Discussion</b>	
<b>Before the project started, was the person affected by air pollution or dust? If yes, explain how and when.</b> <i>Where did the pollution or dust come from? E.g. traffic, machinery, construction, burning garbage, cooking stoves</i> <i>When was the dust or pollution a problem? E.g. all day, at night, intermittently</i>			
<b>During the project, is the person disturbed by dust or pollution? If yes, explain how and when.</b> <i>What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers, burning construction garbage etc</i> <i>When did it disturb the person? E.g. all day, at night, intermittently</i>			

<b>If dust or air pollution from the construction is a problem, what changes does the person suggest are made?</b>	
<b>3. Vegetation</b>	<b>Record of Discussion</b>
<b>Before the project started, what was the vegetation like along the road?</b> <i>E.g. pasture land, trees, shrubs.</i>	
<b>During the project, has the person found the vegetation situation has changed? If yes, explain how and when.</b>	
<b>If impact on vegetation is unacceptable, what changes does the person suggest are made?</b>	
<b>4. Road Safety</b>	<b>Record of Discussion</b>
<b>Before the project started, can you describe the road safety situation at the site/school/house etc?</b> <i>E.g. no problems, some accidents, difficulty crossing the roads</i>	
<b>During the project, has the person found the road safety situation has changed? If yes, explain how and when.</b> <i>Slower traffic so easier to cross the roads, construction vehicles are making a crossing harder / easier, more accidents / less accidents</i>	
<b>If change in road safety is unacceptable, what changes does the person suggest are made?</b>	
<b>5. Land Use and Access</b>	<b>Record of Discussion</b>
<b>During the project, has the person found the access for herders or other land users has changed? If yes, explain how and when</b> <i>E.g. Change pasture quality, access to pasture on both sides of road</i>	
<b>If change in land use and access is unacceptable, what changes does the person suggest are made?</b>	
<b>6. Other issues</b>	<b>Record of Discussion</b>
<b>Any other issues about the construction sites that the person wants to discuss?</b> <i>E.g. Water / wastewater concerns, Garbage disposal, Other concerns</i>	



### POST CONSTRUCTION ENVIRONMENTAL CONDITION MONITORING FORM

<b>Date of Site Visit :</b>		<b>Name of Monitor:</b>	
<b>Type of Site Check (tick)</b>	<i>Before Construction Ends</i> <input type="checkbox"/>	<i>Post-Construction</i> <input type="checkbox"/>	
<b>Site Observations</b>			
<b>1. Condition of Site</b>		<b>Observations</b>	
<b>Garbage</b> <i>Is there construction waste on the site? What type of waste? Is it hazardous? Where is it?</i>			
<b>Land Condition</b> <i>Is any disturbed land and soil properly contoured? Is it re-planted if re-vegetation is needed?</i>			
<b>Contamination</b> <i>Is any land or water at the site contaminated, with chemicals, garbage etc? Are any chemicals spills including fuel, visible?</i>			
<b>Services &amp; Infrastructure</b> <i>Are any services damaged because of the construction? Are drains and culverts blocked or clean? Any damage to buildings, lighting, street signs etc ?</i>			
<b>Community Health &amp; Safety</b> <i>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?</i>			
<b>Other Issues</b>			
<b>Requirements for Contractor</b>			
<b>Issue</b> <i>List Issues and observations that the contractor is required to fix</i>			
<b>Date Requirements Given to Contractor</b>			
<b>Date by Which Contractor Agrees to Fix Issues</b>			

**GRM COMPLAINT FORM**

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