ADB

Initial Environmental Examination (Draft)

Project Number: 50088-002
June 2018

Mongolia: Upscaling Renewable Energy Sector Project

Prepared by the Ministry of Energy for the Asian Development Bank

CURRENCY EQUIVALENTS

(as of 3 June 2018)

Currency Unit	–	Mongolian Tughrik (MNT)
MNT 1.00	=	$0.0004
$1.00	=	MNT 2,411

ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
ASL	Above Sea Level
AuES	Altai-Uliastai Energy System
CEMP	Construction Environmental Management Plan
CES	Central Energy System
CITES	Convention on International Trade in Endangered Species
CRVA	Climate Risk Vulnerability Assessment
DEIA	Detailed Environmental Impact Assessment
DN	Diamètre Nominal/Nominal Diameter
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
FSR	Feasibility Study Report
GDP	Gross Domestic Product
GEIA	General Environmental Impact Assessment
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	Green House Gas
GSHP	Shallow-ground Heat Pump
GIP	Good International Practice
GoM	Government of Mongolia
GRM	Grievance Redress Mechanism
HDI	Human Development Index
HH	Household
IA	Implementing Agency
IBAT	Integrated Biodiversity Assessment Tool
IEC	Independent Environmental Consultant (national)
IEE	Initial Environmental Examination
INDC	Intended Nationally Determined Contributions, Paris climate accord.
IUCN	International Union for the Conservation of Nature
LCoE	Levelized Cost of Energy
MNS	Mongolian National Standard
MoE	Ministry of Energy
MoET	Ministry of Environment and Tourism
NAMEM	National Agency of Meteorology and Environmental Monitoring
NM	National Monument
NP	National Park
NREC	National Renewable Energy Center

OM	Operations Manual, ADB
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PCR	Physical Cultural Resources
PMU	Project Management Unit
PPE	Personnel Protective Equipment
PPTA	Project Preparatory Technical Assistance
PSC	Project Steering Committee
PV	Photovoltaic
SOJSC	State-Owned Joint Stock Company
SPS	Safeguard Policy Statement, ADB
TA	Technical Assistance
TBD	To Be Determined
UNEP	United Nations Environment Program
WB	World Bank
WCS	World Conservation Society
WRES	Western Energy System State Owned Joint Stock Company
WHO	World Health Organization

WEIGHTS AND MEASURES

$\mu g/m^3$	Micrograms per Cubic Meter
BOD_5	Biochemical Oxygen Demand, five days
$CaCO_3$	Calcium Carbonate
cm	Centimeter
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
dB(A)	A-weighted sound pressure level in decibels
DO	Dissolved Oxygen
GWh	Gigawatt Hour
ha	Hectare
kg	Kilogram
km	Kilometer
kV	Kilovolt
kWh	Kilowatt Hour
Leq	Equivalent Continuous Noise Level
m	Meter
m/s	Meters per Second
m^2	Square Meters
m^3	Cubic Meters
masl	Meters Above Sea Level
mg/l	Milligrams per Liter
mg/m^3	Milligrams per Cubic Meter
mm	Millimeter
MW	Megawatt
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
^oC	Degrees Celsius
pH	A measure of the acidity or alkalinity of a solution

PM	Particulate Matter
PM_{10}	Particulate Matter smaller than 10 micrometers
$PM_{2.5}$	Particulate Matter smaller than 2.5 micrometers
SO_2	Sulfur Dioxide
SOx	Sulphur Oxides
TDS	Total Dissolved Solids
TSP	Total Suspended Particulates

NOTES

(i) The fiscal year (FY) of the Government of Mongolia and its agencies ends on 31 December.

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

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EXECUTIVE SUMMARY

A. Introduction

1. This is the Initial Environmental Examination (IEE) report for the proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid systems; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control.

2. ADB's environmental safeguard requirements are specified in the Safeguard Policy Statement (SPS 2009). The Project has been screened and classified by ADB as Environment Category B, requiring the preparation of an IEE including an environmental management plan (EMP).

B. Environmental Policy, Legal and Administrative Framework

Mongolian Requirements

3. Mongolia has enacted a comprehensive policy and legal framework for environmental assessment and management. The hierarchy of policies and legislative provisions for environmental management includes the Constitution, international treaties, policies, and environment and resource protection laws, regulations and standards.

4. The *Law on Environmental Protection* (2012) is the principal law that regulates activities associated with the protection of the environment with special emphasis on 'Natural Resource Reserve Assessment' and 'Environmental Impact Assessment'. The *Law on Environmental Impact Assessment* focusses on environmental protection, the prevention of ecological imbalance, the regulation of natural resource use, and the assessment of environmental impacts of projects and procedures for decision-making regarding the implementation of projects. It also stipulates the environmental impact assessment (EIA) requirements of Mongolia.

5. There are two types of EIAs defined in the *Law on Environmental Impact Assessment*, general EIA (GEIA) and detailed EIA (DEIA). To initiate a GEIA, the project implementer submits a brief description of the project, including the feasibility study, technical details, drawings, and other information to the Ministry of Environment and Tourism (MoET). The Ministry review will lead to one of four conclusions: (i) a DEIA is not required; (ii) the project may be completed pursuant to specific conditions; (iii) a DEIA is necessary; or (iv) cancellation of the project.

6. The *Law on Specially Protected Areas* (2014) regulates the use and procurement of land for state protection, fosters scientific research, and preserves and conserves the land's original condition in order to protect specific characteristics, unique formations, rare and endangered plants and animals, historic and cultural monuments, and natural beauty. The law establishes four protected area categories, each managing land for a different purpose under a separate management directive. These include Strictly Protected Areas (SPAs), National Parks (NP), Nature Reserves (NR) and National Monuments (NM).

7. Mongolia has enacted a number of environmental standards for ambient air, water, and noise, and applicable standards have been utilized in this IEE. In addition, there are also Mongolian occupational health and safety laws and regulations, and Mongolia has signed on to a number of international environmental conventions.

8. The MoET is the agency primarily responsible for the implementation of environmental policy in Mongolia.

ADB Requirements

9. The major applicable ADB policies, regulations, requirements and procedures for EIA are the SPS 2009, and *Environmental Safeguards – A Good Practice Sourcebook* (2012), which jointly provide the basis for this IEE. The SPS 2009 promotes good international practice as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety (EHS) Guidelines*[1] (hereafter referred to as the *EHS Guidelines*). The policy is underpinned by the ADB Operations Manual for the SPS 2009 (OM Section F1/BP, 2013).

10. During the design, construction, and operation of a project the ADB SPS 2009 requires the borrower to follow environmental standards consistent with good international practice (GIP), as reflected in internationally recognized standards such as the *EHS Guidelines*. The *EHS Guidelines* contain discharge effluent, air emissions, and other numerical guidelines and performance indicators as well as prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technology. When host country regulations differ from these levels and measures, the borrower is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower is required to provide justification for any proposed alternatives.

C. Project Description

11. The Project will develop 41.0 megawatts (MW) of solar, wind and Shallow-ground renewable energy (RE) in remote areas of the Western and Altai-Uliastai Energy Systems. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 2021-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg (subdistrict), Umnugovi Soum (district), Uvs Aimag (province), 100 km southwest of the Uvs Aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai Soum, located 220 km southwest of Altai City, the capital of Govi Altai Aimag.
Khovd:	A 100 kW Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

12. The Ministry of Energy (MoE) will be the Executing Agency (EA). The Western Region Energy System State Owned Joint Stock Company (WRES) will be the Implementing Agency (IA) for the subproject in Umnugovi , the Altai-Uliastai Region Energy System State Owned Joint Stock

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

Company (AuES) will be the IA for the subprojects in Altai, Altai Soum and Uliastai, and the National Renewable Energy Center (NREC) will be the IA for Shallow-ground heat pump subproject.

13. The Project has an estimated budget of $66.31 million.

D. Description of the Environment

Mongolia

14. Mongolia is a landlocked country in east-central Asia bordered by Russia to the north and China to the south, east and west. It has an area of 1,564,116 km^2, an average elevation of 1,580 masl, and a population of 3.064 million. With a population density of 1.95 inhabitants per km^2, Mongolia is the most sparsely populated country in the world. Much of the southern portion of the country is taken up by the Gobi Desert, while the northern and western portions are mountainous.

Umnugovi

15. Umnugovi Soum is located in southwestern Uvs Aimag in northwestern Mongolia. The wind farm will be located near the existing Umnugovi substation within Namir Bahg, on a large flat outwash plain at an elevation of 1,615 masl. There are mountainous areas to the north and south, and a shallower ridge to the east past Uvsiin Khar Us Lake. Site topography is generally flat, sloping slightly to the northeast. The land at the site is not currently used or occupied other than the substation.

16. Site soils are semi-desert rocky grey and brown sandy clay loams. The humus content is low in the upper layers at 1.089% and decreases sharply with depth. All soil layers are dominated by sand ranging from 61.3 to 64.2%.

17. Umnugovi has a northern continental climate characterized by long cold winters and short moist summers. The average annual temperature is -1.2 degree Celsius (°C), the coldest month is January with an average low temperature of -28.4°C and a lowest recorded temperature of -45.5°C, and the hottest months are July and August with an average high temperature of 22.5°C and a maximum recorded high of 38.9°C. Average annual relative humidity is 63% and average annual precipitation is 135 mm. Approximately 75% of the annual precipitation falls in summer months. The site area receives an annual average of 2,925 hours of sunlight. Average daily sun shine ranges from 4.7-5.4 hours in winter and 9.4-9.8 hours in summer. The predominant wind direction is from the west.

18. Water resources in Umnugovi Soum are limited, due in part to low precipitation and high evaporation. There are no surface waters on the site; the nearest are Namir River over 9 km to the north, and the Uvsiin Khar Us Lake 11.5 km to the northeast.

19. Vegetation cover in the subproject area is extremely sparse, and is limited to grasses such as feather grass (*stipa gobica*) and couch grass (*Agropyron repens*), and shrubs such as *Caragana pygmaea*. All species found at the project site are common to the area, and there are no known rare or endangered species of flora or fauna within the subproject area.

20. There are no parks, protected areas, nature reserves within or adjacent to the subproject site, and nearby Uvsiin Khar Us Lake is reported by the Soum Governor and local officials for the State Environmental Inspectorate as being turbid and saline, and as a result does not support fish

or resident or migratory water fowl.

21. Umnugovi Soum has a population of approximately 4,200, while the soum center (Umnugovi town) has approximately 2,000 residents. The soum is divided into 5 bahg, Kholboo, Uliast, Orlogo, Bayabngol and Namir. The subproject is located in Namir Bahg.

22. Traditional livestock husbandry is one of the key economic sectors in Umnugovi Soum, including sheep, goat, cattle, camel and horse. Related activities include the sale of sheep and camel wool, cashmere, hides, fermented mare milk, and dairy and meat products. Crop farming has become more significant in recent years, including potatoes and other vegetables.

Uliastai

23. Uliastai City, the capital of Zavkhan Aimag, is located in the south-central portion of the aimag. It is one of the most remote aimag capitals in Mongolia.

24. The PV farm will be located 22.6 km southwest of the city proper (34 km by paved road), south of the Donoi Airfield. The site is situated on a flat north-south oriented valley plain 5 km wide, northwest of the Chigestei River, and surrounded by mountains. The site is flat, sloping slightly toward the river, and is not currently used or occupied. Site soils are infertile pale brown sandy loams.

25. Uliastai has a northern continental climate. The average annual temperature is -2.4°C, the coldest month is January with an average temperature of -23°C and an average minimum temperature of -28°C, and the hottest month is July with an average temperature of 14°C and an average maximum temperature of 22°C. Average annual precipitation is 209 mm, the majority of which falls in the summer months. The driest weather is in February when an average of 1.7 mm of rainfall occurs. The wettest weather is in July with an average of 54.9 mm of rainfall. The site area receives an average of 2,942.2 hours of sunlight per year. The maximum monthly average hours of sunshine occurs in May (311 hours) and the minimum in December (166 hours). Annual mean wind speed is 1.3 m/s.

26. There are no surface water resources at the subproject site. The nearest surface water is the Chigestei River approximately 1 km to the southeast. The river flows from Khangai Mountains to Lake Khyargas. Based on data from 1952 to 2014, the annual mean discharge is 4.2 m^3/s. Approximately 65 to 75 % of annual runoff occurs during the warm period from June to October. Uliastai City is located 25 km upstream where the Chigestai and Bogdiin Gol rivers meet to form the Zahvkhan River.

27. Site vegetation is limited to sparse grasses, low plants and weeds. All flora and fauna species found at the project site are common to the area, and surveys found no rare, endangered or protected species or areas of critical habitat. There are no parks, protected areas, or nature reserves within 50 km of the site.

28. Uliastai is one of the oldest settlements in Mongolia, and has long been an important center of caravan trade even into the 20th century. It was connected by camel caravan routes with Urga (now Ulaanbaatar) in the east, Khovd in the west, Barkol and other points in Xinjiang in the southwest, and Hohhot in the southeast. Currently Uliastai has a population of 15,500. It has soum status and forms an enclave within the surrounding Aldarkhaan soum.

29. The old Uliastai Airport had two unpaved runways and is close to the city, but no longer

receives flights. In 2002, the Donoi Airfield (or "New Uliastai Airfield") was built 25 km west of the city near Aldarkhaan soum, and now serves Uliastai with regular flights to and from Ulaanbaatar. Uliastai is a 16 hour drive from Ulaanbaatar.

Govi Altai

30. Altai City (officially called Yesonbulag Soum), the capital of Govi Altai Aimag, is located on a plateau of Khantaishir Mountain at an elevation of 2,181 masl. The PV farm will be located on a 20 ha site along the paved road from Khovd, north of the Altai Airport, and 1.5 km from the edge of Altai City, in Jargalant Bahg. The site is very flat, with only a few meters elevation change over its length. The land at the site is not currently used or occupied.

31. Site soils are infertile pale brown sandy loams, and have been degraded by erosion and agricultural activities. The humus content is low in the upper layers and the soils are over 70% sand. The site shows signs of heavy metal contamination, though concentrations do not exceed the maximum permissible soil standards.

32. Altai City has a northern continental climate. The average annual temperature is -1.4°C, the coldest month is January with an average low temperature of -18.1°C and a lowest recorded temperature of -40.8°C, and the hottest month is July with an average temperature of 14.3°C and a maximum recorded high of 31.1°C. Average annual relative humidity is 68% and average annual precipitation is 181 mm. Approximately 66% of average annual precipitation falls in summer months, and there is little precipitation in the winter. The site area receives an average of 3,260 hours of sunlight per year. The predominant winds are from the west and northwest.

33. There are no surface water resources on or adjacent to the subproject site, and the nearest surface water body is more than 3 km to the east.

34. The site is a semi urban outskirt area, and has been affected by informal roads, garbage disposal and erosion. It has low value habitat with high rock cover, sandy soils and sparse, stunted vegetation of grasses and shrubs. There are no rare, endangered or protected species of flora or fauna, or areas of critical habitat. There are also no parks, protected areas, nature reserves within or adjacent to the subproject site.

35. Altai City has a population of 18,108, the majority of which is in Orgil Bahg. Jargalant Bahg where the subproject is sited has a population of 1,927. Traditional livestock husbandry is one of the key economic sectors in the soum, including sheep, goat, cattle, camel and horse.

Altai Soum

36. Altai Soum is located 220 km southwest of Altai City, in Govi Altai Aimag. The soum town is on a flat plateau which gently slopes towards and across the China border to the west, and up to the Gobi-Altai Mountain range to the east. The subproject will install an off-grid 500 kW hybrid wind and solar facility. The wind farm site is an abandoned runway, and is completely flat at an elevation of 1,450 masl. Site soils are semi-desert rocky brown sandy loams. All layers are dominated by sand ranging from 52.8 to 54.2%.

37. Altai Soum also has a northern continental climate, but is considerably milder than the other subproject locations due to its more southerly location. The average annual temperature is 6.2°C, the coldest month is January with an average temperature of -12.0°C and a lowest recorded temperature of -30.5°C, and the hottest month is July with an average temperature of

23.2°C and a maximum recorded high of 36.5°C. Air humidity ranges between 60-64% in wintertime and 54-58% in summertime. Average annual precipitation in the soum center is only 52 mm; 94% of precipitation falls in the warm period between April and October as rain, and only 6% as snow between November and March. The site area receives an average of 3,150 hours of sunlight per year. Winds are predominantly from the west and northwest.

38. Altai soum is part of the Southern Altai Gobi Basin. Water resources in the soum are extremely limited; precipitation is low, and rivers flowing from the mountains to the northeast evaporate or infiltrate into thick sediments easily. There no rivers or lakes in the soum town area, though there are some small intermittent streams in the area, and the village is centered on a seep.

39. Vegetation in the subproject site area is sparse with very limited diversity, partially due to low precipitation, and partially due to the wind farm site being on ex-industrial land (an abandoned air strip). There are no known rare or endangered species of flora or fauna within the subproject area.

40. Altai soum is divided into 4 bahg, Badral, Bayantsagaa, Long and Bayan-Ovoo. The subproject is located in Bayan-Ovoo Bahg, the soum town. Altai soum has a population of approximately 2,100, with 1,050 people living in the soum town. Almost 70% of the soum population is between the ages of 16 to 59. Traditional livestock husbandry is the key economic sector in the soum, and there are 227 herder households owning over 100,000 livestock.

Khovd

41. Khovd City is the capital of the Khovd Aimag, and is officially known as Jargalant Soum. The soum is situated in the northwestern portion of the Aimag on an alluvial and diluvial plain at an elevation of 1,405 masl. The city is surrounded by the Mongol Altai Mountains. Kindergarten 1 is a recently constructed 2 story building located in Takhilt Bahg, an urban Ger area in southern Khovd City.

42. Site topography is flat. Site soils are pale brown sandy loams with sand content ranging from 55.7 to 59.4%. Khovd has a northern continental climate and an average annual temperature 0.1°C. The coldest month is January with an average temperature of -17.1°C and a lowest recorded temperature of -40.2°C, and the hottest month is July with an average temperature of 16.6°C and a maximum recorded high of 38.7°C. Average annual relative humidity is 58% and average annual precipitation is 128 mm. Approximately 70% of average annual precipitation falls in summer months. The area receives an average of 2,925 hours of sunlight per year.

43. Khovd City is situated on the banks of the Buyant River, which discharges into the Khovd River and then Khar Us Lake. The subproject site is in an urbanized portion of Khovd City, and has no surface water resources on or near it. The kindergarten is connected to the municipal water supply system

44. Prior to construction the site was an informal road, with no vegetation cover. The site has been completed developed, and has no flora or fauna of ecological value, and no critical habitat. It does not contain any rare or endangered species.

45. Khovd City has a population of approximately 29,000 and an area of 2,550 km^2, of which 1,470 km^2 are pasture. Administratively, the soum is divided into 12 bahg. Takhilt Bahg, where the subproject is located, has a population of 1,868 in 487 households.

46. Traditional livestock husbandry is one of the key economic sectors in Khovd City, including sheep, goat, cattle, camel and horse. In 2016 the soum had 114,000 thousand livestock.

47. According to the latest Mongolia Permafrost Distribution Map, all subproject sites are located in seasonal freezing areas and there is no significant permafrost in the subproject areas.

E. Anticipated Impacts and Mitigation Measures

48. Anticipated positive and negative environmental impacts of the proposed Project were assessed based on a domestic Feasibility Study Report (FSR) and General Environmental Impact Assessment (GEIA) reports; site visits conducted by domestic and international environmental consultants; a climate risk and vulnerability assessment (CRVA); screenings utilizing the Integrated Biodiversity Assessment Tool (IBAT) developed by BirdLife International, Conservation International, IUCN and UN Environment's World Conservation Monitoring Centre; screening utilizing the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR) hazard screening tool ThinkHazard; screening utilizing the Mongolia earthquake risk Modified Mercalli (MM) scale map produced by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA); and, stakeholder and public consultation meetings. Pre-construction, construction, operation and decommissioning phases were each considered separately. Mitigation measures are presented in detail in the subproject EMPs (sub-EMPs, **Appendices I** through **V**).

49. Pre-construction phase negative impacts are typically associated with permanent land acquisition and associated loss of land and/or structures. As there will be no land acquisition for any of the subprojects, there are no associated impacts or mitigation measures required (**Apendix X – Land Clearance Letters from Local Government**).

50. A number of environmental management measures will be implemented in the pre-construction phase during detailed design, including IEE and sub-EMP updating (if necessary); incorporation of environmental mitigation measures into contractor's bidding documents, technical specifications, and contracts for civil construction and equipment installation; implementation of the Grievance Redress Mechanism (GRM); and training and capacity building.

51. Potential negative Project construction phase environmental impacts are low in magnitude, short to medium term in duration, and very localized in scale. They are associated with land preparation for the solar farms and wind turbines, installation of the RE equipment, and other construction activities. Impacts may include soil erosion, construction noise, fugitive dust, wastewater, solid and hazardous waste, and risks to worker and community health and safety. No cultural or heritage sites or critical habitat will be affected. Potential negative construction phase impacts can be effectively mitigated through the application of appropriate good construction practices and compliance with international guidelines including the World Bank Group's *General EHS Guidelines* (2007, covering environment, occupational health and safety, and community health and safety).

52. Operation of the RE subprojects will not produce any air pollution, and only small amount of wastewater will be generated during cleaning of solar farm panels and from domestic sewage. However, there are some moderate potential negative impacts during the operation phase, including noise from turbines, the risk of glare from the solar panels, potential for bird strikes on both solar and wind farms, risks to TL worker health and safety, and risks to community health and safety. Potential operation phase impacts can be effectively mitigated through good design, the application of appropriate good operational management practices, and compliance with

relevant GoM standards.

53. The subproject lifespans are anticipated to be 25+ years, at which point it is expected that they will be decommissioned. Typical activities during the decommissioning and site reclamation phase include facility removal, breaking up of concrete pads and foundations, removal of access roads that are not maintained for other uses, re-contouring the surface (if required), and revegetation. Associated impacts include erosion, noise, dust and vehicle exhaust, and the need to properly manage large amounts of debris, solar panels, wire and cabling, electronics, etc.

54. It is not possible to develop detailed decommissioning plans for events 25+ years in the future. However, at a minimum of 6 months prior to closure a decommissioning and site reclamation plan will be developed for each subproject that effectively addresses potential impacts, and is in accordance with good international practices and relevant government regulations and standards in force at that time.

55. Project operation is expected to result in significant benefits:

- The Project aims to upscale distributed RE systems in remote and less developed regions. It will increase Mongolia's installed RE capacity by more than 47% above 2017 levels.
- The Project will benefit approximately 71,800 households or 258,300 individuals. This will result in approximately 50% of the local population in the targeted regions with access to clean energy.
- The Project will help Mongolia meet its Intended Nationally Determined Contributions (INDC) under the Paris climate accord.
- The Project will reduce electricity imports from the Siberian Grid by 94.3 GWh per year. GHG emission savings from project operation are estimated at 87,969 tons CO_2e per year or 2.2 million tons CO_2e over the project's 25 years lifetime. Reduced pollutant emissions are estimated at 306 tons of SO_2 annually (7,655 tons over the project lifetime), 385 tons of NOx annually (9,630 tons over the project lifetime), 59 tons of PM_{10} (1,482 tons over the project lifetime), and 49 tons of $PM_{2.5}$ (1,235 tons over the project lifetime).
- Substituting imported electricity from Siberian grid will bring economic benefits estimated at $7.5 million per year. In 2016, electricity imports into Mongolia represented 19.9% of total consumption. The foreign exchange savings from avoided electricity imports can be redirected to other economic and social development activities in these regions.

F. Alternative Analysis

56. An analysis of Project alternatives was undertaken to determine the most financially and technically feasible way of achieving the Project objectives while minimizing environmental and social impacts.

57. Site alternatives were considered, including three site options for the Umnugovi and Uliastai subprojects and 10 different site options for the Khovd subproject. For the wind subprojects a range of wind turbine sizes were considered, and for the solar subprojects various technologies were considered before monocrystalline silicon solar PV was selected. A range of battery types were also considered.

G. Information Disclosure and Public Consultations

58. Public consultation meetings were held in mid-October 2017 and March 2018 to introduce the Project's goals and activities, discuss the EIA process and environmental issues, and receive

stakeholder's opinions on the Project and the EIA. A total of 338 people attended the meetings, and the Project received strong public support.

H. Grievance Redress Mechanism

59. A project-level GRM has been developed to receive and facilitate resolution of complaints on social and environmental issues about the Project during the construction and operation phases. The GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to the complainants transparently and in a reasonable time period.

I. Subproject Environmental Management Plans

60. A subproject Environmental Management Plan (sub-EMP) has been prepared for each phase I subproject (**Appendices I** through **V**). The objectives of the sub-EMPs are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009.

J. Conclusion

61. The Project environmental assessment process has: i) selected appropriate technologies to reduce the emission of pollutants; ii) identified potential negative environment impacts and appropriately established mitigation measures; iii) received public support from the project beneficiaries and affected people; iv) established effective project GRM procedures; and v) prepared comprehensive subproject EMPs including environmental management and supervision structure, environmental mitigation and monitoring plans, and capacity building and training.

62. Overall, any minimal adverse environmental impacts associated with the Project can be prevented, reduced, or minimized through the appropriate application of mitigation measures. It is therefore concluded that: i) the Project's categorization as ADB environment category B is confirmed; ii) this IEE is considered sufficient to meet ADB's environmental safeguard requirements for the project, and no additional studies are required; and (iii) the project should be supported by ADB, subject to the implementation of the commitments contained in the EMP and allocation of appropriate technical, financial and human resources by the EA and IAs to ensure these commitments are effectively and expediently implemented.

I. INTRODUCTION

A. The Project

1. This is the IEE report for the proposed *Upscaling Renewable Energy Sector Project* in Mongolia. The proposed Project will i) increase the renewable energy (RE) capacity for electricity and heating supply in remote grid systems (**Figure 1**); and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control.

2. Mongolia currently has a total of 1,158 megawatt (MW) of installed capacity, but because of aging power facilities that are well past their economic life, only 969 MW is available. Growing power demand over the past decade is stressing the power system. Imported electricity met around 20% of power demand in 2017.[2] The energy sector in Mongolia relies heavily on coal-fired power generation which accounts for 91% of total installed capacity, and contributes over 63% of carbon dioxide (CO_2) emissions. Mongolia is the world's fifth most carbon-intense economy, but has tremendous renewable energy potential which could theoretically meet all long term domestic demand. Promoting a diversified energy mix with a higher share of renewable energy is a core priority both to reduce dependence on high cost imported electricity and to decarbonize the energy sector. The Government of Mongolia has taken several initiatives for renewable energy deployment since 2000, most notably (i) implementing the successful 100,000 Solar Ger Electrification Program (2000–2012) which provided access to modern energy to nomadic herders through solar home systems; and (ii) enacting the *Law on Renewable Energy*, which involves a set of regulatory arrangements with a US dollar denominated feed-in-tariff, which has facilitated the development of 110 MW of solar photovoltaic (PV) and wind power plants.[3] However, as of late 2017 in terms of total capacity is only 11.3%.

3. The Project aims to develop the 41.0 megawatts (MW) of distributed solar and wind RE in the Western and Altai-Uliastai Energy Systems of western Mongolia. The successful completion of the Project will see the establishment of an institutional platform that encourages private sector investment in distributed RE to sustainably expand clean and affordable electricity supply in remote and less developed regions of Mongolia, and to decarbonize the energy sector in the country.

4. The Ministry of Energy (MoE) will be the Executing Agency (EA). The WRES will be the IA for the subproject in Umnugovi , the AuES will be the IA for the subprojects in Altai, Altai Soum and Uliastai, and the NREC will be the IA for Shallow-ground heat pump subproject.

5. The Project will be delivered through three components and a number of subprojects, implemented over two phases, with the first phase from 2018-2021 and the second from 2019-2023:

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[2] Renewable energy is competitive with imported electricity which currently costs $0.12–$0.15 per kilowatt-hour (kWh). Total expenditure for electricity import in 2017 amounted to $116 million.

[3] The Law on Renewable Energy guarantees long term payment for feed-in-tariff at $0.08–$0.095 per kWh for wind power, $0.15–0.18 per kWh for solar photovoltaic, and $0.045–$0.06 per kWh for hydropower. It was amended in 2015 to introduce renewable energy surcharge on end-user bill for financially sustainable feed-in-tariff payment.

Figure 1: Mongolia map.

Component 1: Distributed renewable energy system development. The subprojects comprise a total of 40.5 MW of solar PV and wind power in the Western and Altai-Uliastai regions. These subprojects will be implemented in two phases:(i) first phase “core” subprojects (2018-2021) with 25.5 MW capacity; and (ii) second phase “non-core” subprojects (2019-2023) with 15 MW capacity.

Component 2: Shallow-ground heat pump demonstration. This component will install 500 kW thermal of Shallow-ground heat pump capacity in public buildings in five townships of the targeted region. In Phase I 100 kW will be installed in a kindergarten in the Khovd, the Uvs Aimag center. Additional subprojects will be rolled out in Phase II based on the initial subproject experience.

Component 3: Institutional strengthening and capacity enhancement. The component will (i) enhance technical capacity of local utilities and the national dispatching center in renewable energy investment planning, transparent selection and bidding, renewable electricity dispatch, and grid control and protection; and (ii) support preparation of renewable energy investment plan 2023-2030 in targeted regions. The Project has an estimated budget of $66.31 million.

B. Report Purpose

6. Environmental safeguard requirements are specified in the Safeguard Policy Statement (SPS 2009). The Project has been screened and classified by ADB as Environment Category B, requiring the preparation of an IEE including an EMP.

7. This IEE covers the phase one Component 1 and 2 subprojects. A separate environmental assessment and review framework (EARF) has been developed to provide guidance on screening and categorization, assessment, planning, institutional arrangements, and processes to be followed, for Phase II subprojects. There are no physical works in Component 3, and it is not addressed in this report.

C. Approach to IEE Preparation

8. This IEE report has been prepared based on domestic FSR; GEIA report; site visits conducted by domestic and international environmental consultants; CRVA; screenings utilizing the IBAT developed by BirdLife International, Conservation International, IUCN and UN Environment's World Conservation Monitoring Centre; screening utilizing the World Bank GFDRR hazard screening tool ThinkHazard; screening utilizing the Mongolia earthquake risk Modified Mercalli (MM) scale map produced by the United Nations OCHA; and, stakeholder and public consultation meetings.

D. Report Structure

9. This IEE report consists of an executive summary, nine chapters and six appendices. The report is structured as follows:

Executive Summary
Summarizes critical facts, significant findings, and recommended actions.

I Introduction
Introduces the proposed Project, report purpose, approach to IEE preparation and IEE structure.

II Policy, Legal, and Administrative Framework
Discusses Mongolia's and ADB's environmental assessment legal and institutional frameworks, status of approval of the domestic GEIA and DEIA reports, and applicable environmental guidelines and standards.

III Description of the Project
Describes the Project rationale, components, location, implementation arrangements, budget and time schedule.

IV Description of the Environment
Describes relevant physical, biological, and socioeconomic conditions within the Project area.

V Anticipated Environmental Impacts and Mitigation Measures
Describes impacts predicted to occur as a result of the Project, and identifies the mitigation measures which will be implemented.

VI Analysis of Alternatives
Presents an analysis of alternatives undertaken to determine the best way of achieving the Project objectives while minimizing environmental and social impacts.

VII Information Disclosure, Consultation, and Participation
Describes the process undertaken for engaging beneficiaries and carrying out IEE disclosure and public consultation.

VIII Grievance Redress Mechanism
Describes the Project GRM for resolving complaints.

IX Conclusion and Recommendation
Presents conclusions drawn from the assessment and recommendations.

Appendixes
Appendices I through V present the phase I subproject environmental management plans (sub-EMPs), including required construction and operation phase environmental mitigation measures, environmental monitoring and reporting requirements, and capacity building. Other appendices present supporting information, including the domestic EIA approval, records from the public consultation activities, and an environmental monitoring report template.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Mongolia Environmental Policy and Legal Framework

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 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 includes the Constitution, international treaties, policies, and environment and resource protection laws, regulations and standards.[4]

1. Legal Framework

11. Environmental policy reform undertaken since the early 1990s has resulted in a large number of environmental laws, the ratification of most international environmental conventions, protection of a substantial area of the country in the protected area system, and an increased presence of Non-Governmental Organizations (NGOs). A summary of relevant environmental legislation is presented in **Table 1**.

a) Constitution

12. Article 16.1.2 of the *Constitution of Mongolia* (1992) states that everyone has the right to live in a healthy and safe environment and to be protected against environmental pollution and ecological imbalance.

b) Law on Environmental Protection

13. The *Law on Environmental Protection* (2012) is an overarching law for all environmental legislation. It is the principal law that regulates activities associated with the protection of the environment with special emphasis on ‘Natural Resource Reserve Assessment’ and ‘Environmental Impact Assessment’. It governs the land and subsoil, mineral resources, water resources, plants, wildlife and air, and requires their protection against adverse effects to prevent ecological imbalance. The environmental protection law regulates the inter-relations between the state, citizens, economic entities and organizations, with a guarantee for the human right to live in a healthy and safe environment. It aims for an ecologically balanced social and economic development, the protection of the environment for present and future generations, the proper use of natural resources, including land restoration and protecting land and soil from adverse ecological effects. Article 7 of the law requires the conduct of natural resource assessment and environmental impact assessment to preserve the natural state of the environment, and Article 10, the conduct of environmental monitoring on the state and changes of the environment. National policy to protect ecologically significant aspects of the environment and to restore natural resources is prepared under the *Law on Environmental Protection*.

14. The latest amendment to the *Law on Environmental Protection* (2012) establishes the liability of polluters to pay compensation for damage caused to the environment and natural resources. The amount of compensation payable depends on the natural resources that have

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

suffered the damage.

Table 1: Applicable Mongolian environmental laws.

Current Laws	Latest Changes
Law on Environmental Protection	Amended, 2012
Law on Environmental Impact Assessment	Amended, 2012
Law on Development Policy Planning	Enacted, 2015
Law on Air	Amended, 2012
Law on Fees for Air Pollution	Amended, 2012
Law on Water	Amended, 2012
Law on Water Pollution Fees	Enacted, 2012
Law on Fees for the Use of Natural Resources	Amended, 2012
Law on Forests	Amended, 2012
Law on Waste	Enacted, 2012
Law on Hazardous Substances and Chemicals	Amended, 2006
Law on Land	Amended, 2015
Law on Land Fees	Amended 2012
Civil Code of Mongolia	Amended 2014
Law on Cadastral Mapping and Land Cadastral	Amended 2011
Law on Subsoil	Amended, 1995
Law on Soil Protection and Combating Desertification	Created, 2012
Law on Special Protected area	Amended, 2014
Law on Buffer Zones	Enacted, 1997
Law on Protection of Plants	Amended, 2011
Law on Natural Plants	Amended, 2012
Law on Fauna	Amended, 2012
Law on Minerals	Amended 2015
Law on Fire Safety	Amended, 2015
Law on Disaster Protection	Amended, 2012
Law on Sanitation	Amended, 2012
Law on Protection of Cultural Heritage	Amended 2014
Law on Labor Safety and Hygiene	Amended, 2015

Source: ADB PPTA consultants.

c) Law on Environmental Impact Assessment

15. The *Law on Environmental Impact Assessment* (2012) stipulates the EIA requirements of Mongolia (described further below). The purpose of this 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.

d) Law on Water

16. The *Law on Water* (2012) regulates relations pertaining to the effective use, protection and restoration of water resources. It specifies regular monitoring of the levels of water resources, quality and pollution, and provides safeguards against water pollution.

e) Law on Wastes

17. Governs the collection, transportation, storage, and depositing in landfills of household

and industrial waste, re-using waste as a source of raw materials to eliminate hazardous impacts of household and industrial waste on public health and the environment. Undertakings that generate significant amount of wastes must dispose of the wastes in designated landfills that meet prescribed standards.

f) Law on Specially Protected Areas

18. The *Law on Specially Protected Areas* (2014) regulates the use and procurement of land for state protection, fosters scientific research, and preserves and conserves the land's original condition in order to protect specific characteristics, unique formations, rare and endangered plants and animals, historic and cultural monuments, and natural beauty. The law establishes four protected area categories, each managing land for a different purpose under a separate management directive. These include Strictly Protected Areas (SPA), National Parks (NP), Nature Reserves (NR) and National Monuments (NM).

g) Health and Safety

19. In addition to environmental laws and regulations, there are occupational health and safety laws and regulations the EA and IAs must comply with:

- Article 16 of the National Constitution of Mongolia states that every employee has the right to "suitable conditions of work".
- The Mongolian Labor Code (1999) is the main piece of legislation guiding employment in Mongolia. It covers collective contracts and agreements, labor contracts, remuneration, working hours, working conditions, public holidays, vacations, safety, employment of minors and the disabled, dispute resolution and labor monitoring by the State.
- The government adopted a National Program for Occupational Safety and Health Improvement in 2001 and national standards were also adopted such as the National Standard on Occupational Health and Safety MNS 5002:2000.
- The Law on Labor Safety and Hygiene (2008) covers requirements for industrial buildings and facilities, requirements for machinery and equipment, requirements for hazardous chemicals and explosives, fire safety, medical check-ups, personal protective equipment, training, rights to favorable working conditions and investigation of accidents and occupational diseases.

h) Electricity Generation

20. The regulatory framework for electricity generation includes:

- The *Law on Energy* (February 2001) defines the legal framework of the sector, describes the duties and responsibilities of stakeholder like the Mongolian parliament, government, ministry and energy regulatory commission and other parties, owner-ship form, classification of energy facilities, and license and energy tariff issues. According to this law Mongolian energy sector was uncoupled and divided into classifications of generation, transmission grid, distribution grid, dispatching and consumer.
- The *Law on Renewable Energy* (January 2007) brought additional legal framework for the supply and utilization of electricity from renewable energy resources like wind, solar and hydro. The law described all duties and responsibility of stakeholders and the feed-in tariffs for the renewable energy sources, validation time of feed-in tariffs and power purchase agreements.

- The Mongolian grid code provides information on terms and definitions and procedures, is one of the main legal frameworks for grid connected operation.
- The *Law on Construction* provides information on construction processes in Mongolia.

2. Environmental Policy Framework

21. 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 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.

22. Mongolia has also developed a number of key policy documents, including:

- Biodiversity Conservation Action Plan, 1996;
- State Environmental Policy, 1997;
- Mongolian Action Program for the 21st Century (Map21), 1998;
- National Action Plan for Climate Change, 2000;
- National Plan of Action to Combat Desertification, 2000;
- National Plan of Action for Protected Areas, 1997;
- National Environmental Action Plan, 1996, 2000; and
- Green Development Policy of Mongolia, 2014.

23. 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.

3. Environmental Institutional Framework

24. The State Great Khural of Mongolia is the highest organ of State power and the supreme legislative power. The State Great Khural is unicameral and consists of 76 members elected by the mixed electoral system.

25. The Ministry of Environment and Tourism (MoET) is the agency primarily responsible for the implementation of environmental policy in Mongolia. Agencies under the MoET with responsibility for environmental protection and management include:

- The Department of Green Development Policy and Planning is responsible for developing national advocacy, legislation, policies, strategies and programs on environmental protection and green development in accordance with the sustainable development goals of the country; developing financial and investment plans, and provide comprehensive policy guidance. Additional responsibilities include: coordination across sectors to promote green development consistent with ecological principles; planning and initiation of regional and international participation of Mongolia in solving global environmental challenges; and development of policies, programs and projects that introduce clean technologies, and scientific and technological achievements.

- The Department of State Administration and Management is responsible for administration and leadership in the MoET. Its functions include addressing human resource management and development issues, providing legal advice, introducing best practices for administration in the MoET, developing systems of reporting and accountability, resolving appeals and complaints, and improving organizational management. The department focuses on ensuring the continuity and stability of MoET operations by way of professional and disciplined departments, and on developing human resource policies and improving the effectiveness of their implementation, guidelines and recommendations on required future courses of action.
- The Department of Environment and Natural Resources is responsible for the planning and implementation of actions to reduce environmental degradation and adverse environmental impacts, and ensuring the appropriate use of natural resources. Its functions include implementing laws and regulations, policy, programs, and activities related to the conservation and appropriate use of natural resources; restoring areas that have suffered from degradation; organizing and coordinating biological conservation activities; conducting environmental assessments and maintaining the Environmental Information Databank; and organizing training and public awareness activities related to environmental conservation. Activities undertaken in this context include:
    - Reviewing EIAs;
    - Monitoring the implementation of environmental monitoring programs, environmental protection plans, and rehabilitation programs of mines; receiving and reviewing annual reports on the above activities; and issuing professional guidelines and recommendations on required future courses of action;
    - Conducting environmental assessments and maintaining the State Environmental Information Databank;
    - Maintaining a unified registry of very toxic, toxic, and harmful chemicals, and issuing authorizations for their manufacture and import; and,
    - Coordinating household and industrial waste management policy; and managing air pollution.
- The Department of Specially Protected Areas Administration and Management has been entrusted with the responsibility of implementing the laws and regulations concerning Specially Protected Areas (SPAs). Its functions include coordinating activities related to the expansion of the SPA network and the implementation of associated programs, projects, and actions, as well as providing professional and practical assistance to the administrative authorities of SPAs. It focuses on ensuring the integration of policies and actions promoting sustainable natural resource use and ecological balance. These responsibilities are carried out by developing partnerships with all organizations engaged in policy implementation, ensuring the effective allocation of resources, and organizing and coordinating their activities in line with government policy, programs, and plans.
- The Ecologically Clean Technologies and Science Division is responsible for developing and promoting clean technologies in Mongolia by introducing cleaner production technology to all aspects of production and services.
- The Department of Monitoring, Evaluation and Internal Auditing responsibilities are to monitor and control the implementation of policy planning and its operational phases, to evaluate results, to create information databases, to present statistical data and to ensure transparency and information disclosure.
- The Department of Land and Water is responsible for implementing government policy and decisions related to the sustainable use, protection and restoration of land and water

resources in Mongolia; signing and monitoring the implementation of contracts and agreements, in the name of the MoET, with relevant foreign and domestic organizations, companies, and individuals; collecting fees and payments for the use of land and water resources and allocating these according to the appropriate procedures; and allocating and reporting on the use of funds for their conservation and restoration of land and water resources.

- The National Agency for Meteorology, Hydrology and Environmental Monitoring is responsible for managing a national, integrated hydrological, meteorological, and environmental monitoring network; ensuring preparedness for potential natural disasters or major pollution incidents; establishing conditions to permit the full and complete use of meteorological and hydrological resources; continuously monitoring radioactivity, air and water pollution, and soil contamination levels; and providing essential hydrological, meteorological, and environmental data to state and government officials, businesses, and individuals.

4. International Environmental Commitments

26. Mongolia has signed on to a number of international environmental conventions, including:

- World Heritage Convention, 1990;
- Convention on Biological Diversity, 1993;
- UN framework convention in Climate Change, 1994;
- UN Convention on Combatting Desertification, 1996;
- The Convention on Wetlands of International Importance, especially as Waterfowl Habitat 'Ramsar Convention', 1996;
- 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;
- Convention on Migratory Species of Wild Animals /Bonn Convention, 1999;
- Kyoto Protocol, 1999;
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 2000;
- Cartagena Protocol, 2002; and,
- Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), 2004.

27. In addition, the Mongolia has ratified the following International Labor Organization (ILO) core labor standards:

- Abolition of Forced labor (C105);
- Child Labor (C182);
- Discrimination (C111);
- Freedom of Association and the Right to Organize (C87);
- Equal Remuneration (C100);
- Minimum Age (C138); and,
- Right to Organize and Collective Bargaining Convention, 1949 (C098).

5. Environmental Impact Assessment Legal Framework and Procedures

28. The *Law on Environmental Impact Assessment* (1998, amended 2002, and amended 2012) regulates Mongolian EIA requirements, including all new projects as well as the renovation and expansion of existing industrial, service and construction activities and project which use natural resources. 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. Depending on the type and size of the planned activity, the responsible party for implementing the EIA law will be either MoET or *aimag* government (provincial government).

29. There are two types of EIAs defined in the EIA Law: an initial screening through a General EIA (GEIA), and a full Detailed EIA (DEIA). The GEIA, developed by the project implementer, includes i) baseline description of the affected environment; ii) description of the proposed project including drawings; iii) technical and economic justification for the project; and iv) written opinion of the soum (district) governor, and is submitted to the MoET. The review of the GEIA will lead to one of four conclusions:

- (i) project may be implemented without conducting a DEIA;
- (ii) project may be implemented without conducting a DEIA, but with specific conditions and/or impact mitigation measures;
- (iii) project requires a further DEIA; or
- (iv) project rejected on grounds of non-conformity with relevant legislation, or the adverse impact of the equipment and technology on the environment are too great, or absence of the project in the land management.

30. The review of the GEIA is free and usually takes about 12 working days.

31. The scope of the DEIA (if required) is defined in a Terms of Reference (ToR) prepared by the GEIA review committee. The DEIA report must be prepared by a MoET authorized Mongolian company, and should be submitted to the MoET or aimag government by the project proponent. A DEIA typically includes:

- (i) Environmental baseline data;
- (ii) Project and technology alternatives;
- (iii) Recommended measures to mitigate and eliminate potential; adverse impacts;
- (iv) Analysis of the extent and distribution of adverse impacts and consequences;
- (v) Risks assessment;
- (vi) Environmental management plan to include environmental protection (mitigation) plan and environmental monitoring program;
- (vii) Opinions and comments of affected households in the project area;
- (viii) If applicable other issues regarding cultural heritage in the project area and special nature of the project; and
- (ix) If applicable a rehabilitation plan.

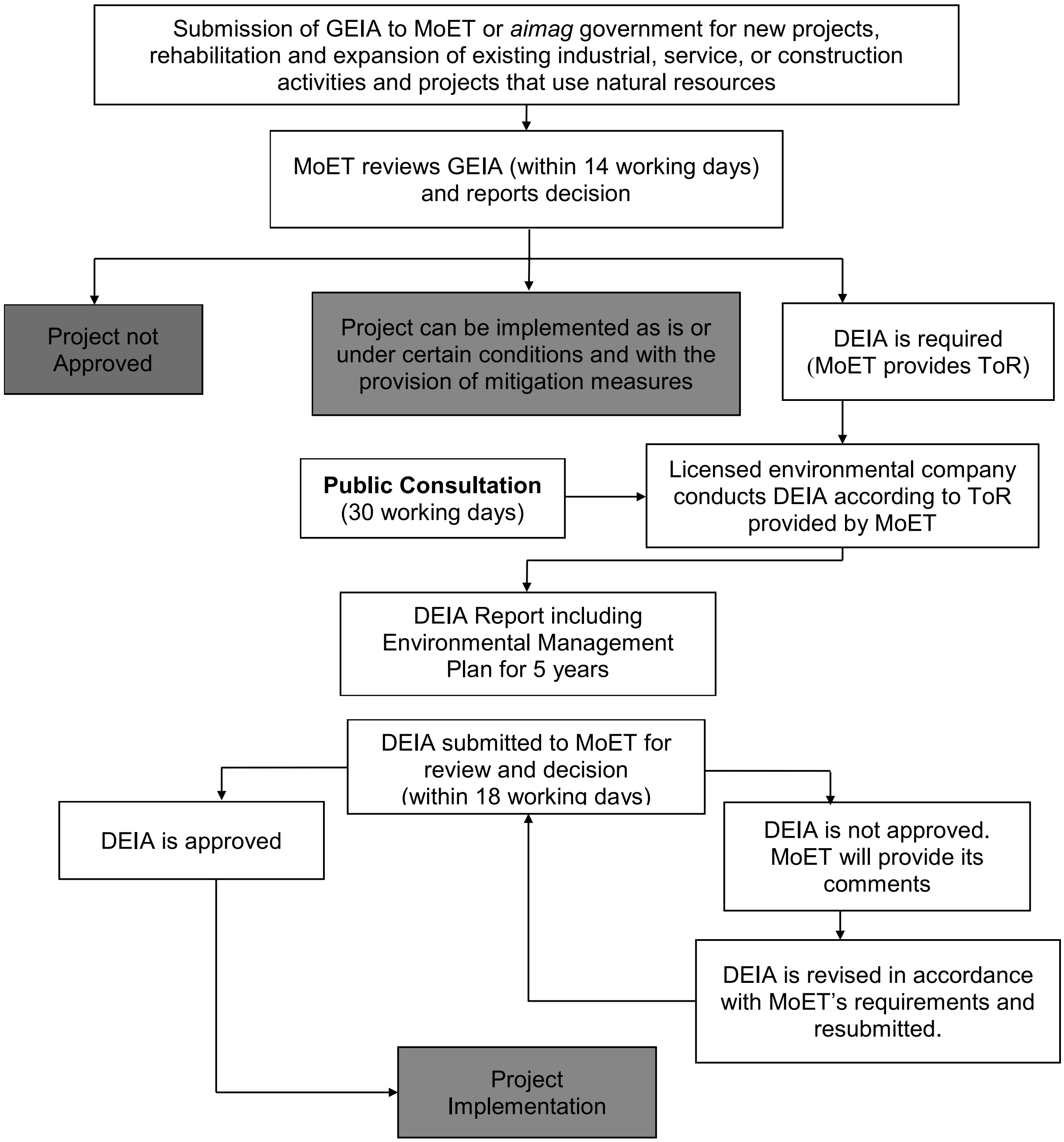
32. The reviewer(s) of the GEIA also review the DEIA, generally within 18 working days, and present the findings to the MoET. Based on the content of the DEIA, reviewer conclusions, and any additional comments by MoET departments, MoET issues a decision on whether to approve or reject the project.

33. **Figure 2** presents a simplified diagram of the EIA procedure in Mongolia.

6. Mongolian EIA Report

34. A Project GEIA was prepared by PPTA national environmental specialist and was submitted to MoET. Based on the review of the GEIA by MoET, a qualified national consultant was recruited to prepare a Project DEIA (Sunny Trade Co. Ltd. LLC). The DEIA has been prepared and submitted to MoET for approval.

Figure 2: EIA procedure in Mongolia.



B. Applicable Mongolian Environmental Standards

35. Mongolian National Standards (MNS) prescribe allowable ambient and discharge standards for ambient air, noise, water and soil quality, and industrial effluent, wastewater, boiler emissions, etc.. Relevant MNS are discussed below.

1. Ambient Air Quality

36. The Mongolian *Law on Air* regulates protection of ambient air, prevention from pollution, and reduction and monitoring of emissions of air pollutants. The Mongolian ambient air quality standards are presented in MNS 4585: 2007.

37. The World Health Organization (WHO) Air Quality Guidelines are recognized as international standards and are adopted in the *EHS Guidelines*. In addition to guideline values, interim targets (IT) are given for each pollutant by the WHO as incremental targets in a progressive reduction of air pollution.

38. The WHO guidelines and corresponding MNS are presented in **Table 2**. Overall the MNS for ambient air quality exceed or show a high degree of equivalency to the WHO guidelines or IT values, and are adopted for use in this report.

Table 2: Mongolian ambient air quality standards (MNS 4585: 2007) and WHO Guidelines.

Pollutant	Averaging Period	Mongolian Standards (µg/m³)	WHO ambient air quality guidelines (GL) and interim targets (IT), (µg/m³)
Nitrogen Dioxide (NO_2)	20 Minute	85	
	1 hour	-	200
	24 hour	40	-
	Annual	30	40
Sulphur Dioxide (SO_2)	10 Minute	500	500 (GL)
	15 Minute	-	-
	20 Minute	450	-
	1 Hour	-	-
	24 hour	20	125 (IT-1) 50 (IT-2) 20 (GL)
	Annual	10	-
Particulate Matter (PM_{10})	24 hour	100	150 (IT-1) 100 (IT-2) 75 (IT-3) 50 (GL)
	Annual	50	70 (IT-1) 50 (IT-2) 30 (IT-3) 20 (GL)
Particulate Matter ($PM_{2.5}$)	24 hour	50	75 (IT-1) 50 (IT-2) 37.5 (IT-3) 25 (GL)
	Annual	25	35 (IT-1) 25 (IT-2) 15 (IT-3) 10 (GL)
Carbon Monoxide (CO)	30 Minute	60,000	-
	1 hour	30,000	-
	8 Hour	10,000	-
Ozone (O_3)	8 hour	100	160 (IT) 100 (GL)
Lead (Pb)	24 hour	1	-
	Annual	0.5	-

Source: Mongolian *Law on Air* and WHO Air Quality Guidelines (2006) in IFC EHS Guidelines (2007).

2. Boiler Emissions

39. Mongolian boiler emission standards and EHS guidelines are presented in **Table 3**. Monglian standard for SO_2 is more stringent than EHS guidelines value while the EHS guidelines value for NO_x is more strigent than Mongolian standard, The project shall adopt the more stringent standards during implementation.

Table 3: Mongolian boiler emission standards and EHS guidelines.

Parameter	Mongolian Standard and EHS Guidelines (mg/Nm^3 at one atmospheric pressure and 0 °C)							
	MNS 5043-2016: Hot water boilers with heating capacity up to 4.2 MW. General technical requirements.		**MNS 5216-2016**: Household stoves. General technical requirements.		**MNS 6298-2011**: Maximum acceptable level and measuring method or air pollutants in in flue gas of new thermal power plants and thermal plants.		**EHS Guidelines 2007**: Small Combustion Facilities Emissions Guidelines (3 – 50 MWth).	
SO_2	mg/Nm^3	600-1000 depending on type of fuel (liquid, gas and solid)	mg/Nm^3	1200	mg/Nm^3	400 urban 600 remote areas	mg/Nm^3	2000
NO_x	mg/Nm^3	230-500 depending on type of fuel (liquid, gas and solid)	mg/Nm^3	700	mg/Nm^3	450-1.100 based on volatile coal	mg/Nm^3	650
CO	mg/Nm^3	115-9700 depending on type of fuel (liquid, gas and solid)	mg/Nm^3	9800	mg/Nm^3	180-300	-	-
PM	mg/Nm^3	170-300 depending on type of fuel (liquid, gas and solid)	mg/Nm^3	100	mg/Nm^3	50-200	mg/Nm^3	50-150
Dry Gas Excess O_2 Content	-	-	-	-	-	-	%	6

Source: Environmental Monitoring Report #2, Ulaanbaatar Urban Services and Ger Areas Development Investment Program, June 2017 and IFC EHS Guidelines (2007).

3. Water

40. **Table 4** summaries Mongolian ambient water quality standards MNS 4585: 2007, **Table 5** summaries Mongolian drinking water standards MNS 0900: 2005, and **Table 6** summarizes effluent wastewater quality standards MNS 4943: 2011. The *EHS Guidelines* recommend that discharges of process wastewater, sanitary wastewater, wastewater from utility operations or stormwater to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria. The MNS water and wastewater standards are adopted for use in this report, supported by the WHO Guidelines for Drinking-water Quality, Fourth Edition (2011).

Table 4: Mongolian ambient water quality standards (MNS 4585: 2007).

Parameter	Unit	Standard
(pH)		6.5-8.5
Dissolved Oxygen (O_2)	mgO/l	6&4 not less
BOD_5	mgO/l	3
COD	mgO/l	10
NH_4-N	mgN/l	0.5
NO_2-N	mgN/l	0.02
NO_3-N	mgN/l	9
PO_4- P	mgP/l	0.1
Chloride Cl	mg/l	300
Fluoride F	mg/l	1.2
SO_4	mg/l	100
Manganese Mn	mg/l	0.1
Nickel Ni	mg/l	0.01
Copper Cu	mg/l	0.01
Molybdenum Mo	mg/l	0.25
Cadmium Cd	mg/l	0.005
Cobalt Co	mg/l	0.01
Lead Pb	mg/l	0.01
Arsenic As	mg/l	0.01
Total Chromium Cr	mg/l	0.05
Hexavalent chromium (Cr^{6+})	mg/l	0.01
Zinc Zn	mg/l	0.01
Mercury Hg	mg/l	0.1
Mineral oil	mg/l	0.05
Phenol	mg/l	0.001

Source: Mongolian Standard MNS 4586:1998.

Table 5: Mongolian Drinking Water Standards (MNS 0900: 2005).

Parameter	Unit	Standard
Physical Quality		
pH	mg/l (milligrams/liter)	6.5-8.5
Hardness	mg equivalent/l	7.0
Total Dissolved Solids (TDS)	mg/l	1000.0
Turbidity	mg/l	1.5
Taste	Score	2.0
Odor	Score	2.0
Color	Degree	20
Inorganic Quality		
Molybdenum (Mo)	mg/l	0.07
Barium (Ba)	mg/l	0.7
Boron (B)	mg/l	0.5
Copper (Cu)	mg/l	1.0
Calcium (Ca2+)	mg/l	100.0
Magnesium (Mg2+)	mg/l	30.0
Manganese (Mn)	mg/l	0.1
Sodium (Na)	mg/l	200.0
Phosphate (PO_4-)	mg/l	3.5
Fluoride (F)	mg/l	0.7-1.5
Selenium (Se)	mg/l	0.01
Strontium (Sr)	mg/l	2.0
Sulfate (SO_4-)	mg/l	500.0

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

Source: Mongolian Standard MNS 0900: 2005.

Table 6: Mongolian effluent wastewater quality standard (MNS 4943: 2011).

Parameter	Unit	Standard
Water temperature	^oC	20
pH	-	6-9
Odor	Sense	No smell
Total Suspended Solids (TSS)	mg/l	50
BOD_5	mg O_2/l	20
COD	mg O_2/l	50
Permanganate oxidizing capacity	mg O_2/l	20
Total Dissolved Solids (TDS)	mg/l	1,000 *
Ammonia Nitrogen (NH_4)	mg N/l	6
Total Nitrogen (TN)	mg/l	15
Total phosphorous (TP)	mg/l	1.5
Organic phosphorous (DOP)	mg/l	0.2
Hydrogen sulphide (H_2S)	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^{6+})	mg/l	Absent
Total cyanide (CN)	mg/l	0.05
Free cyanide	mg/l	0.005
Copper (Cu)	mg/l	0.3
Boron (B)	mg/l	0.3
Lead (Pb)	mg/l	0.1
Zinc (Zn)	mg/l	1
Cadmium (Cd)	mg/l	0.03
Antimony (Sb)	mg/l	0.05
Mercury (Hg)	mg/l	0.001
Molybdenum (Mo)	mg/l	0.5
Total Arsenic (As)	mg/l	0.01
Nickel (Ni)	mg/l	0.2
Selenium (Se)	mg/l	0.02
Beryllium (Be)	mg/l	0.001
Cobalt (Co)	mg/l	0.02
Barium (Ba)	mg/l	1.5
Strontium (Sr)	mg/l	2
Vanadium (V)	mg/l	0.1
Uranium (U)	mg/l	0.05
Oil and grease	mg/l	1
Fat	mg/l	5
Surface active agents	mg/l	2.5
Phenol (C_6H_5OH)	mg/l	0.05
Trichloroethylene (C_2HCl_3)	mg/l	0.2
Tetrachloroethylene	mg/l	0.1
Chlorine remains (Cl)	mg/l	1
Bacteria triggering water-borne disease	-	Absent in 1 mg of water

Source: Mongolian Standard MNS 4943: 2011.

4. Groundwater

41. The Mongolian standard outlining the general requirements for protection of groundwater (MNS 3342: 1982) indicates that the contamination of groundwater with industrial raw materials, products and municipal wastes during transportation and storage is prohibited. Relevant

requirements in the standard include:

a. Raw materials and products for industrial and municipal waste storage tanks with potential to contaminate groundwater resources should comply with following:
   - Geological - hydrogeological investigations of the storage tank construction, potential soil infiltration estimates of geological materials, groundwater protection measures to be developed based on the amount and characteristics of the chemicals stored.
   - Storage tanks to be tested for leakage prior to use.
   - For areas at the base of mountains, loops of rivers, river beds and highly fractured parts of geological sediments which are used for drinking water, storage tanks cannot be established in these regions.

b. In case of ground water contamination due to accidents, the damaged area should be protected, spill gathered without further distribution, the prohibition of drinking water collection from this area, and quick organization and removal of traces of contamination.

c. In the event of ground water pollution or when the contamination reaches dangerous levels, the method of observation and control will depend on the ground water quality, its intended use and the potential consequences of the pollution.

42. There is no equivalent standard recommended in the *EHS Guidelines,* and the MNS standard is adopted for use in this report.

5. Soil

43. Mongolian standards for heavy metals in soil are presented in MNS 5850: 2008.

Table 7: Mongolian heavy metals standard (MNS 5850: 2008).

Parameter	CR	Pb	Cd	Ni	Zn
Mongolian Standard (MNS 5850: 2008)	150	100	3	150	300

Source: MNS 5850: 2008.

6. Noise

44. Mongolian noise standards are set out in the national standard MNS 4585: 2007 and are compared with relevant international guidelines from the WHO (as presented in the *EHS Guidelines*) in **Table 8**. The classes within the standards are not directly comparable, however WHO noise guidelines are more stringent than Mongolian standards for sensitive receptors. Subprojects close to sensitive receptors will comply with WHO noise guidelines.

Table 8: Mongolian noise standard (MNS 4585: 2017) and WHO Guidelines.

Parameter	MNS Standard dB(A)		WHO Guideline dB(A)	
	Daytime 07:00 – 23:00	**Night 23:00 – 07:00**	**Daytime 07:00 – 22:00**	**Night 22:00 – 07:00**
Maximum Environmental Noise Exposure for the Public	60	45	WHO Class I - Residential, institutional, educational: 55 WHO Class II - industrial, commercial: 70	WHO Class I - Residential, institutional, educational: 45 WHO Class II - Industrial, Commercial: 70

Source: MNS 4585: 2007 and WHO Noise Quality Guidelines (1999) in IFC EHS Guidelines (2007).

7. Hazardous Wastes

45. Mongolia's hazardous waste classification list was approved in 2015 by the Government of Mongolia (GoM) Resolution No. 263.[5] Of direct relevance to the Project, under the list all batteries and accumulators are classified as hazardous waste. More specifically, Li-Ion batteries are classified as hazardous waste under waste classification code "16 06 06 - other batteries and accumulators". The list makes no reference to solar panels, though wastes from electrical equipment containing PCBs, HCFCs, HFCs, asbestos and other hazardous components are also classified as hazardous waste.

8. Special Protected Areas

46. The *Law on Special Protected Areas* (15 November 1994) is intended to protect the natural landscape, rare fauna and flora, historical and cultural sites and natural sightseeing sites.

47. The law classifies State special protected areas into four categories: i) strictly protected areas; ii) national conservation parks; iii) nature reserves; and iv) monuments. Strictly protected areas are further divided into three zones based on natural forms, features of soil, water, fauna, flora and its vulnerability to human activities: i) pristine zone; ii) conservation zone; and iii) limited use zone.

48. In the pristine zone, only protection activities conformant with the need to preserve original natural features may be conducted; research and investigation activities may be conducted only in the way of observation methods and without causing any damage to the natural features. All other activities are prohibited within this zone. In the conservation zone, biotechnological measures that use environmentally safe technologies may be implemented to enhance flora and fauna reproduction and to mitigate damages caused by natural disasters. The following activities may be conducted in the limited use zone using environmentally safe technologies and with appropriate licenses or permits:

- soil and plant cover restoration;
- forest maintenance and cleaning;

[5] Hazardous waste classifications system in Mongolia, Resolution no. 263 dated 29 June 2015 signed by Prime Minister and Minister of MoET.

- animal inventories and activities to regulate animal population numbers, age, sex and structure, following an approved program and methods;
- use of mineral water and other treatment and sanitation resources;
- ecotourism organized following designated routes and areas, according to appropriate procedures;
- use of accommodations according to appropriate procedures and designated for temporary residence, camping, observation, research or investigation by travelers or other people with permission;
- taking photographs, making audio and video recordings and using them for commercial purposes;
- worshipping natural sacred sites and conducting other traditional ceremonies; and,
- collect and use the associated natural resources and medicinal and food plants, according to established regulations, for household needs.

C. Applicable ADB Policies, Regulations and Requirements

49. The major applicable ADB policies, regulations, requirements and procedures for environmental assessment are the SPS 2009, and the *Environmental Safeguards – A Good Practice Sourcebook* (2012), which jointly provide the basis for this IEE. The SPS 2009 promotes good international practice as reflected in internationally recognized standards such as the World Bank Group's *EHS Guidelines*. The policy is underpinned by the ADB Operations Manual for the SPS (OM Section F1, 2013).

50. The 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 line with applicable regulatory requirements, and are not likely to cause significant environment, health, social, or safety hazards.

51. At an early stage in the project cycle, typically the project identification stage, ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Project screening and categorization are undertaken to:

a. reflect the significance of the project's potential environmental impacts;
b. identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, magnitude and sensitivity of the proposed project's potential impacts; and,
c. determine consultation and disclosure requirements.

52. ADB assigns a proposed project to one of the following categories:

a. **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an EMP, is required.
b. **Category B**. Proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An IEE, including an EMP, is required.
c. **Category C**. Proposed project is likely to have minimal or no adverse

environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.

d. **Category FI**. Proposed project involves the investment of ADB funds to, or through, a financial intermediary.

53. The project has been classified by ADB as environment category B, requiring the preparation of an IEE (this report).

54. The SPS 2009 requires a number of additional considerations, including: (i) project risk and respective mitigation measures and project assurances; (ii) project-level grievance redress mechanism; (iii) definition of the project area of influence; (iv) physical cultural resources damage prevention analysis; (v) occupational and community health and safety requirements (including emergency preparedness and response); (vi) economic displacement that is not part of land acquisition; (vii) biodiversity conservation and natural resources management requirements; (viii) provision of sufficient justification if local standards are used; (ix) assurance of adequate consultation and participation; and (x) assurance that the EMP includes an implementation schedule and measurable performance indicators. These requirements, which may not be covered in the domestic EIA, have been considered, and all applicable environmental requirements in the SPS 2009 are covered in this IEE.

D. Other Relevant Guidelines

55. During the design, construction, and operation of a project, the ADB SPS 2009 requires the borrower to follow environmental standards consistent with GIP, as reflected in internationally recognized standards such as the World Bank Group's *EHS Guidelines*. The *EHS Guidelines* contain discharge effluent, air emissions, and other numerical guidelines and performance indicators as well as prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technology. When host country regulations differ from these levels and measures, the borrower/client is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client is required to provide justification for any proposed alternatives.

56. The *EHS Guidelines* include *General EHS Guidelines* (covering environment; occupational health and safety; and community health and safety), Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution, Environmental, Health, and Safety Guidelines for Wind Energy, and Environmental, Health, and Safety Guidelines for Geothermal Projects.

III. PROJECT DESCRIPTION

A. The Project

57. The Project will i) increase the renewable energy capacity for electricity and heating supply in remote grid systems; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control.

58. The Project will develop the 41.0 MW of solar, wind and Shallow-ground RE in the Western and Altai-Uliastai Energy Systems. The successful completion of the Project will deliver clean electricity to around 77,000 households in remote and less developed regions while decarbonizing the energy sector in the country.

B. Country Context and Rationale

59. Mongolia is a land-locked country with an estimated population of 3.06 million. It is the most sparsely populated country in the world with only 1.95 persons per km^2. Population and economic activities are concentrated in the capital, Ulaanbaatar, which accounts for 42% of the population and 49% of the country's gross domestic product (GDP). Ulaanbaatar is the largest energy demand center accounting for nearly half of the total energy needs in the country. **Table 9** presents a comparison of per capita electricity consumption in Ulaanbaatar and selected aimags. Per capita consumption in aimags ranges from 274 to 508 kWh, a difference of +85%.

Table 9: Population and electricity consumption.

	Total population (1000s)	**Household population** (1000s)	**Total electricity consumption** (million kWh)	**Household consumption** (million kWh)	**kWh/ Household**	**kWh/ person**
Mongolia	3,064	870	5,446	1,321	6,261	1,778
Ulaanbaatar (capital)	1,381	381	2,121	811	5,570	1,536
Aimags in the Western Region						
Khuvsgul	129	38	35	17	932	274
Bayan-Ulgii	99	24	33	21	1,417	335
Govi-Altai	57	16	29	13	1,778	508
Zavkhan	71	21	23	13	1,096	326
UVs	81	22	32	17	1,498	396
Khovd	85	22	38	20	1,753	450

kWh = kilowatt-hour.

60. Mongolia is the world's fifth most carbon-intense economy. Coal is the dominant energy resource accounting for 60% of primary energy and 95% of secondary energy, and has been the only energy resource available at an affordable cost in the country. Coal resources are estimated at 179 billion tons which could potentially generate 285,741 terawatt-hour (TWh) of electricity, enough to meet total electricity demands in the People's Republic of China, Japan and the Republic of Korea for the next 20 years.

61. Due to its long cold winters, the country's electric power system is built around the heating system. The winter climate in Mongolia is extremely harsh with daytime temperatures ranging

from -10 degrees Celsius (°C) to -30°C, and can drop to below -40°C at night. The heating season is unusually long at eight months, and energy demand for heat load is over two times that for electricity. The coal-dominated heat and power system contributes more than 63% of the country's carbon dioxide (CO^2) emissions.

62. Mongolia's power system is comprised of four grid systems which provide electricity access to 97% of the population. The central energy system (CES) covers around 90% of power demand. The other three grid systems are the Western Energy System (WES), the Altai-Uliastai Energy System (AuES), and the Eastern Energy System (EES). These systems are located in remote and less developed regions and supply power to about 32% of the local population; these grids have witnessed more than 10% annual load growth for the last five years.

63. As of 2016, Mongolia had a total installed capacity 1,158 MW of which RE was only 87 MW (including hydropower plants); thus, RE is only 7.5% of total capacity (see **Table 10** and **Table 11**). The CES has already attracted more than 400 MW of private sector-led utility scale RE projects, of which 110 MW has been commissioned (the 100-MW wind farm in Salkhit and Tessi, and the 10 MW Darkhan solar plant). Outside the CES private investments in RE development is limited mainly due to relatively small scale power demands and high logistical costs.

Table 10: Installed capacity of RE sources in Mongolia, 2017.

Renewable energy source	Installed capacity
Hydro	25.835
Wind	100.00
Solar	11.33
Total	**137.17**

Source: Ministry of Energy (March 2017).

64. Coal-fired generation accounts for 95.7% of total electricity output. Generation from renewable energy sources is only 4.2% of total output (**Table 11**).

Table 11: Electricity production by source, million kWh.

	2011	2012	2013	2014	2015	2016	% 2016
Coal-fired CHPs (lignite)	4,450	4,775.5	5,014	5,191.3	5,415.6	5,551.6	95.7
Diesel	20.2	28.7	5.4	8.2	6.4	6.1	0.11
Hydro	52.6	52.1	59.9	66.3	59.3	84.7	1.46
Wind	0	0	52.9	125.4	152.5	157.5	2.72
Solar	0	0	0	0.6	0.6	0.6	0.010
Total production	**4,522.8**	**4,856.3**	**5,132.2**	**5,391.8**	**5,634.4**	**5,800.5**	**100.0**
Share of RE							**4.2**

CHP = combined heat and power, kWh = kilowatt-hour.
Source: Ministry of Energy (March 2017) as cited in GCF proposal of XacBank LLC

65. Mongolia is endowed with enormous potential RE resources, primarily solar and wind, which are effectively infinite compared to energy demand; the technical potential is about 1,000 times the total electricity output in 2016. The country's current situation presents a unique opportunity for clean energy development to foster economic transformation and a sustainable future based on shared prosperity. The government recognizes the need to expand the energy

sector and effectively develop and utilize the enormous RE potential, and transition away from fossil fuels. This transition will not happen unless RE systems are commercialized in areas outside the CES. Given the lack of private sector interest in the targeted regions, concessional funds are needed in the near term to address fiscal constraints and buy down the cost of capital so that development can be accelerated. The proposed Project addresses the energy trilemma head-on by delivering access to affordable and sustainable energy.

C. Project Components and Phases

66. The Project will be delivered through three components and a number of subprojects. It will be implemented over two phases, with the first phase from 2018-2021 and the second from 2021-2023.

Component 1: Distributed renewable energy system development. The subprojects comprise a total of 40.5 MW of solar PV and wind power in the Western and Altai-Uliastai regions. Advanced energy storage will be installed in selected subprojects for grid stability and time-shifting. These will be implemented in two phases:(i) phase one “core” subproject (2018-2021) with 25.5 MW capacity; and (ii) phase two “non-core” subprojects (2019-2023) with 15.0 MW capacity.

The core subprojects will cover areas with higher energy demands in Umnugovi Soum (Uvs Aimag), Uliastai (Zavkhan Aimag), Altai City (Yesonbulag Soum, Govi-Altai Aimag), and Altai Soum (Govi-Altai Aimag). The second phase (2019-2023) will cover Telmen (Zavhan Aimag) and Moron (Khovsgol Aimag). Lessons from the implementation of the first phase will be considered as the Project moves towards the implementation of the second phase.

Component 2: Shallow-ground heat pump demonstration. The component will install 500 kW thermal of Shallow-ground heat pump capacity in public buildings in five townships of the targeted region, supplying air pollutant free space heating for 10,000 square meters of floor area. In phase one 100 kW will be installed in a kindergarten in Khovd, the Uvs Aimag center. Four additional subprojects will be rolled out in phase two based on the initial subproject experience.

Component 3: Institutional strengthening and capacity enhancement. The subproject will (i) enhance technical capacity of local utilities and the national dispatching center in renewable energy investment planning, transparent selection and bidding, renewable electricity dispatch, and grid control and protection; and (ii) support preparation of renewable energy investment plan 2023-2030 in targeted regions.

67. The Project aggregate capacity is expected to generate 98.77 gigawatt-hour (GWh) annually.

68. **Table 12** provides summary information on the Component 1 to 3 subprojects, and **Figure 3** shows subproject locations.

D. Umnugovi 10 MW Wind Power

69. A 10 MW wind farm will be developed at Namir Bahg (subdistrict), Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs Aimag capital. The wind farm will be located on a flat outwash plain 11.5 km southwest of Uvsiin Khar Us Lake (**Figure 4**). The nearest turbine will be

approximately 9 km from the edge of Umnugovi town.

Table 12: Scaling Up Renewable Energy Components and Phases. Phase I subprojects are denoted by shading.

Location/Province	Applied Renewable Energy Technology	Capacity (MW)	Construction Period
a. Distributed Renewable Energy System Development			
Umnugovi / Uvs	Wind Power	10.0	2018-2021
Altai / Govi-Altai	Solar PV	10.0	2018-2021
Altai Soum / Govi-Altai	Solar PV/Wind hybrid and battery storage	0.5	2018-2021
Uliastai / Zhavhan	Solar PV and battery storage	5.0	2018-2021
Telmen / Zhavhan	Wind Power	5.0	2019-2022
Moron / Khovsgol	Solar PV	10.0	2019-2022
Subtotal		40.5	
b. Shallow-ground Heat Pump Demonstration			
Hovd, other Soums	Shallow-ground Heat Pump	0.5	2018-2023
Total		41.0	

MW = megawatt, PV = photovoltaic.

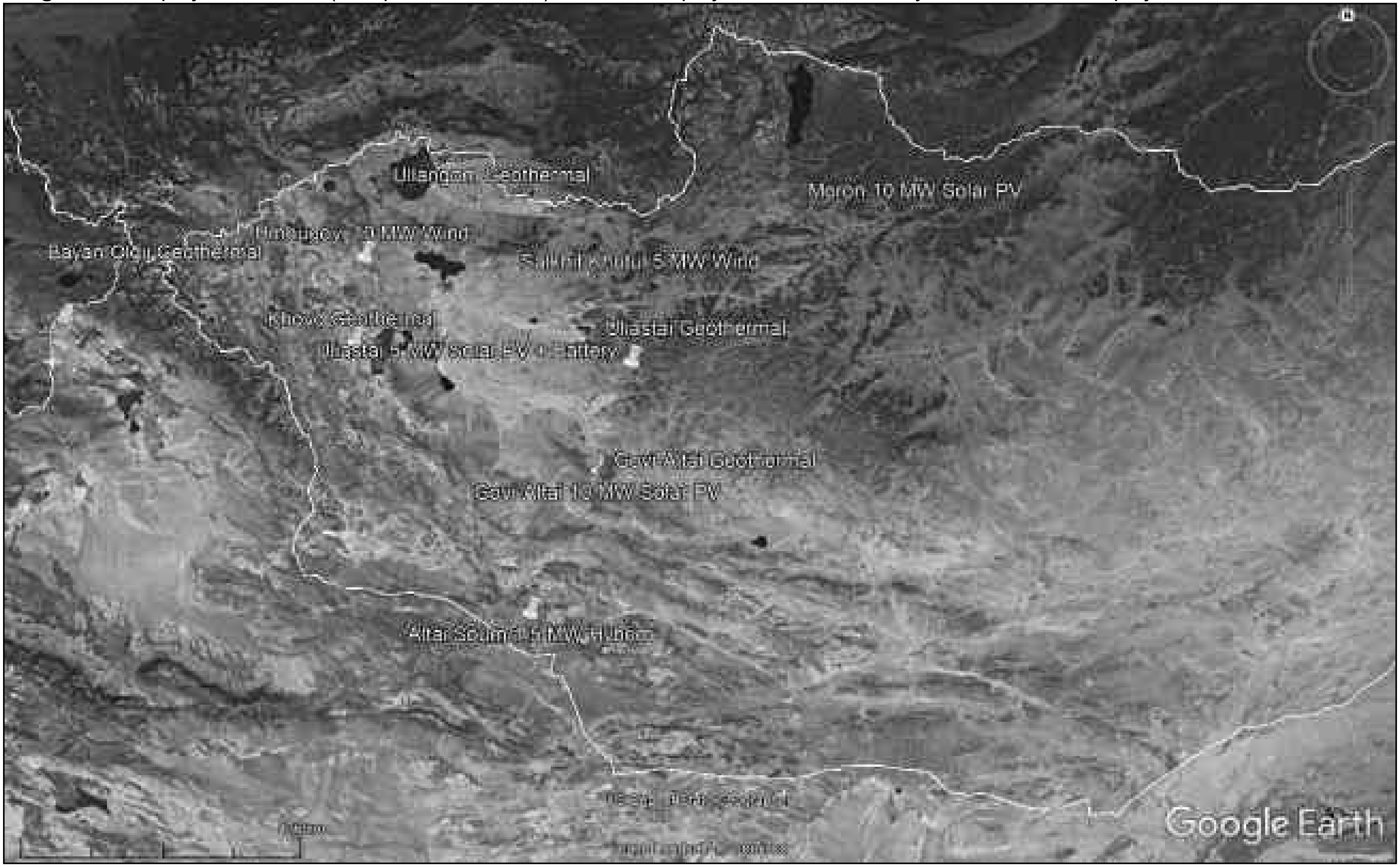
70. The wind farm will be equipped with five 2 MW wind turbines which will be sourced internationally. **Figure 5** shows a typical wind farm utilizing 2 MW turbines produced by Vestas Wind Systems A/S, a manufacturer from Denmark. **Table 13** presents specifications for the turbines, which are broadly representative of turbines available on the international market. The wind farm is expected to produce 25,297 MWh/year, enough electricity to meet the demands of 53,300 Mongolian homes. The wind farm will connect to the existing Umnugovi substation via a dedicated 6.7 km long 35 kV overhead power line (OPL). The line will be 3 phase pole mounted using 150 sq mm ACSR conductors.

71. The Umnugovi substation is an associated facility of the subproject. Located 3.5 km southeast of Umnugovi town, it was built in 1990 following Russian substation design standards (**Figure 6**). It has a 6.3 MW capacity 110/35/10 kV transformer and includes a 110 kV feed transmission line from Russia to the north, a 35 kV transmission line out to Ulgi Soum, a 10 kV transmission line to Umnugovi Soum, and a 110 kV transmission line to Hovd/Bayan Ulgi Aimags to the south. It operates under the authority of the WES SOJSC.

72. A 10 MVA 110/35 kV transformer will be installed within the substation to receive power from the farm. The WES SOJSC has reviewed the proposed works and raised no objections since the new transformer will be located within the existing substation yard. The MoE will issue a Technical Condition document that specifies the connection standards.

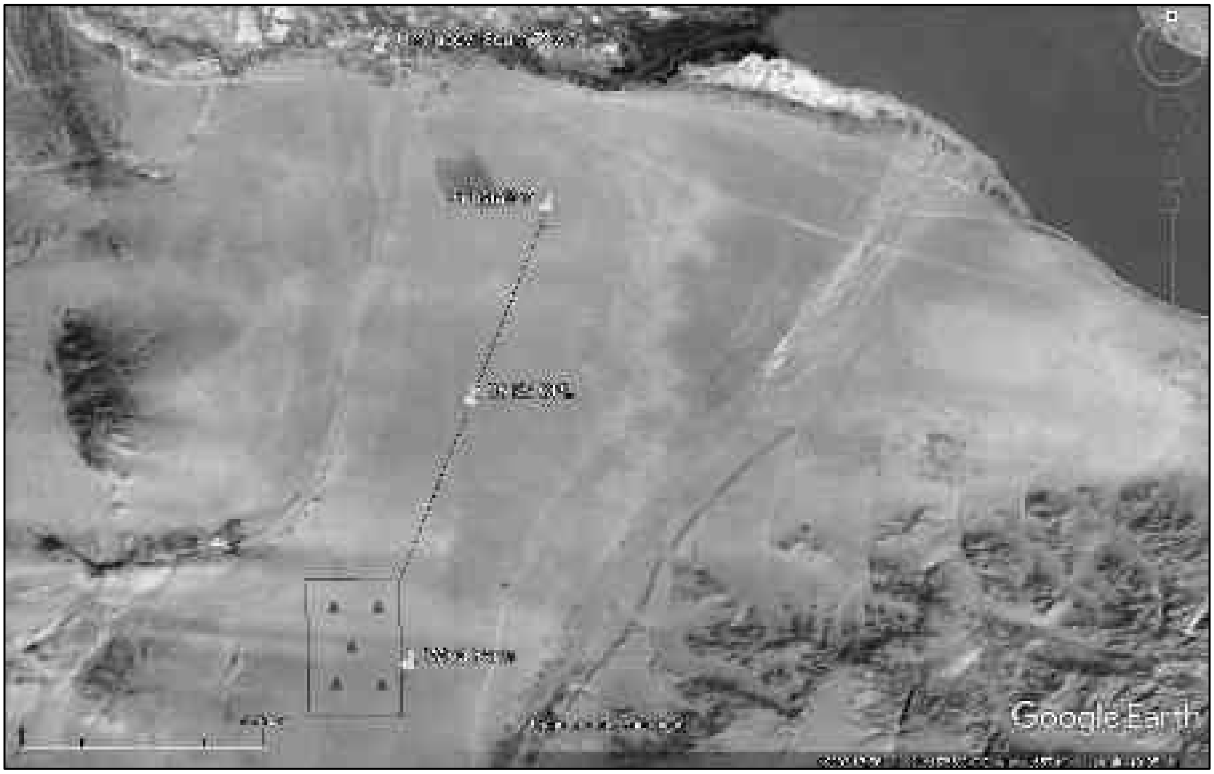
73. Substation staff report that the substation has operated in accordance with applicable Mongolian requirements, and there have been no public complaints about its operation. The station is isolated, are there are no sensitive receptors in its vicinity.

Figure 3: Subproject locations (Components 1 and 2). Phase I subprojects are denoted in yellow, Phase II subprojects in blue.



Source: PPTA consultant 2017, and Google Earth 2017.

Figure 4: Location of Umnugovi wind farm, Umnugovi Town, Avs Aimag. Turbine and OPL locations are indicative only.



Source: PPTA consultant, 2017, and Google Earth, 2017.

Figure 5: Example of a wind farm utilizing Vestas V80-2.0 2.0 MW turbines.

Source: Wind Technik Nord, 2017.

Table 13: Specification, Vestas V80-2.0 2.0 MW turbines.

Power/Wind Speed		**Generator**	
Rated power:	2,000.0 kW	Type:	Double Fed Asyn
Cut-in wind speed:	4.0 m/s	Number:	1
Rated wind speed:	15.0 m/s	Speed, max:	2,016.0 U/min
Cut-out wind speed:	25.0 m/s	Voltage:	690.0 V
Survival wind speed:	60.0 m/s	Grid connection:	Thyristor
Rotor		Grid frequency:	50 Hz
Diameter:	80.0 m	**Tower**	
Swept area:	5,027.0 m²	Hub height:	60/67/78/100 m
Number of blades:	3	Type:	Steel tube
Rotor speed, max:	19.0 U/min	Shape:	conical
Tipspeed:	80 m/s	Corrosion protection:	coated
Type:	NACA 63 FFA-W3	Manufacturer:	Vestas
Material:	GFK	Weight	
Manufacturer:	Vestas	Single blade:	No
Power density 1:	397.9 W/m²	Rotor:	37.2 t
Power density 2:	2.5 m²/kW	Nacelle:	61.2 t
Gear box		Tower, max:	220.0 t
Type:	spur/planetary	**Noise Level**	93-102 dB(A)
Stages:	3.0		
Ratio:	1:101		

Source: Vestas Wind Systems A/S, 2017.

Figure 6: Umnugovi 110/35/10 kV substation.

Source: PPTA consultant, 2017.

74. Work of Umnugovi subproject is expected to start in 2018, and the farm is expected to be commissioned in 2020. The farm will have a 25+ year life.

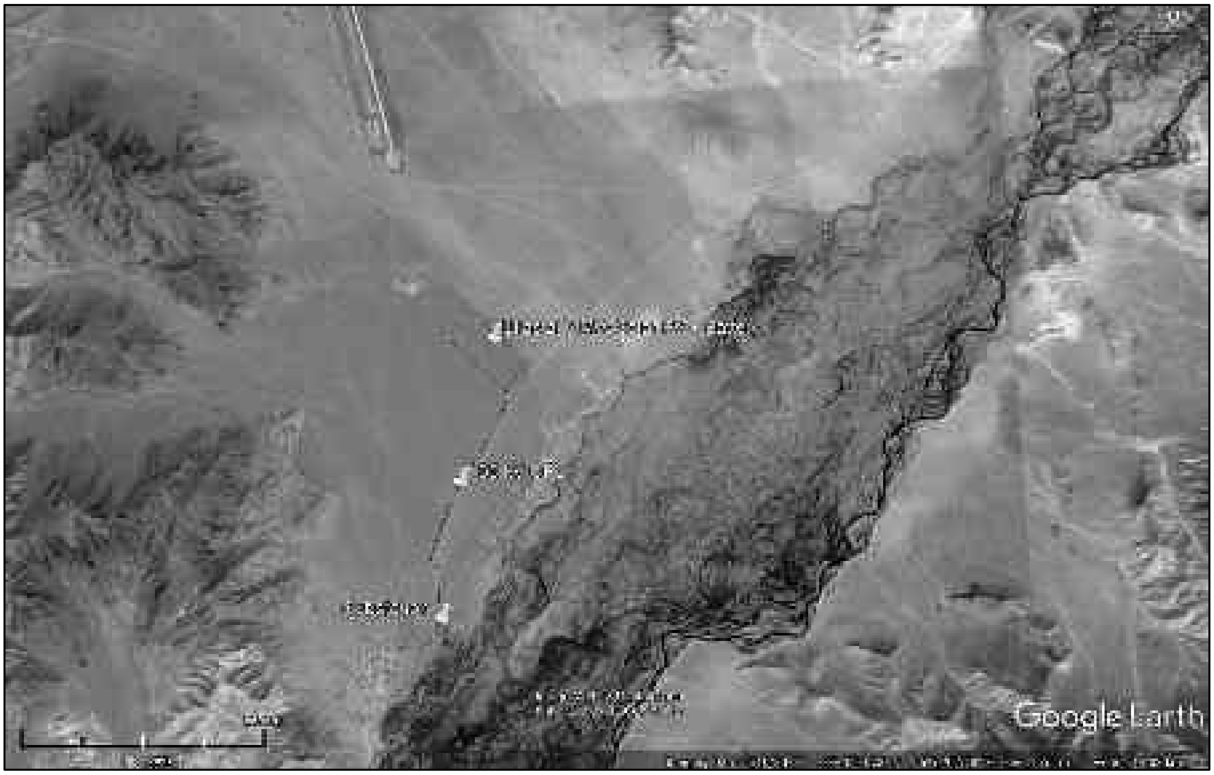
E. Uliastai 5 MW Solar PV with Battery Storage

75. A 5 MW solar PV farm with battery storage will be established in Uliastai City, the capital of Zavkhan Aimag. The capital is located in the south-central portion of the aimag, and has a population of 15,500. Uliastai is about midway on the 110 kV AuES backbone line. The resident utility, Altai-Uliastai Power Co. (AUPC) experiences supply shortage which diminishes the capacity to accommodate additional load and thus strongly welcomes enhanced generation.

76. The PV farm will be located 22.6 km southwest of the city proper (34 km by paved road), south of the Donoi Airfield, in Mandaat Bag, Aldarkhaan Soum, and 1 km to the northwest of the Chigestei River.

77. The site soil is suitable for ramming PV mounting poles and local officials report that there is no danger of flooding. The site is 600 x 130 m, with a 25° western azimuth of the small side towards the prevailing wind direction to minimize cloud shading impact (**Figure 7**).

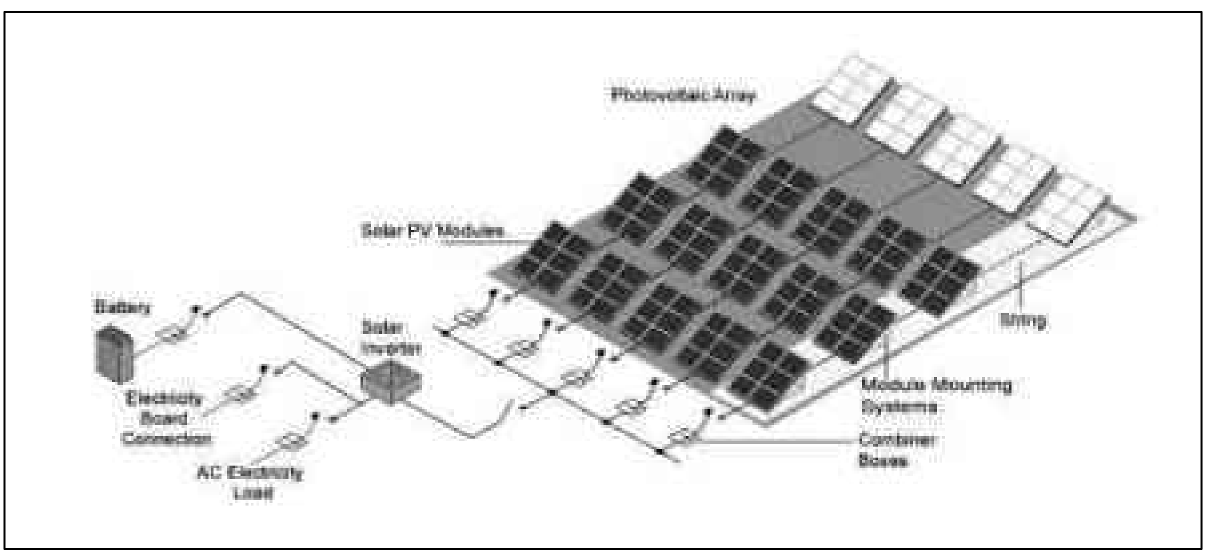
Figure 7: Solar PV farm location, Mandaat Bag, Aldarkhaan Soum, Zavkhan Aimag. OPL location is indicative.



Source: PPTA consultant, 2017, and Google Earth, 2017.

78. PV generation plants are fast to install, easy to expand and simple to maintain. This makes them an ideal power source for the remote and difficult to access rural sites of Mongolia. The PV farm design concept layout consists of solar panel fields, wiring and connectors, and inverters producing AC power which is then up-linked to the main lines of the grid (**Figure 8**).

Figure 8: PV farm components.



Source: PPTA consultant, 2017.

79. The 5 MW PV farm will consist of 16,512 mono-crystalline PV panels mounted 3 horizontally per structure on rammed, double pole support structures in a total of sixty-four 142 m long rows. The solar panels will be mounted on rammed poles, high enough to be clear from snow accumulations in winter. They will be tilted at a fixed angle selected to emphasize maximum production towards the load peaks in the afternoons and in the winter seasons. A drainage and rain water collection system will be included to provide site drainage and flood protection, and avoid relying on well water for panel cleaning.

80. Every 2 rows of panels will form a group connected to a 150 kW inverter, and there will be a total of 4 PV panel groups. The solar panel strings will be connected in vented collector boxes from which ground cables will lead to the inverters. The inverters will step up voltage into the feeder line.

81. **Figure 9** presents the solar PV farm layout while **Table 14** presents indicative design parameters for the farm. **Figure 10** presents an estimation of the plant´s electricity production, based on the PVGIS-SARAH online irradiation database, and is subject to individual module and inverter performance parameters.

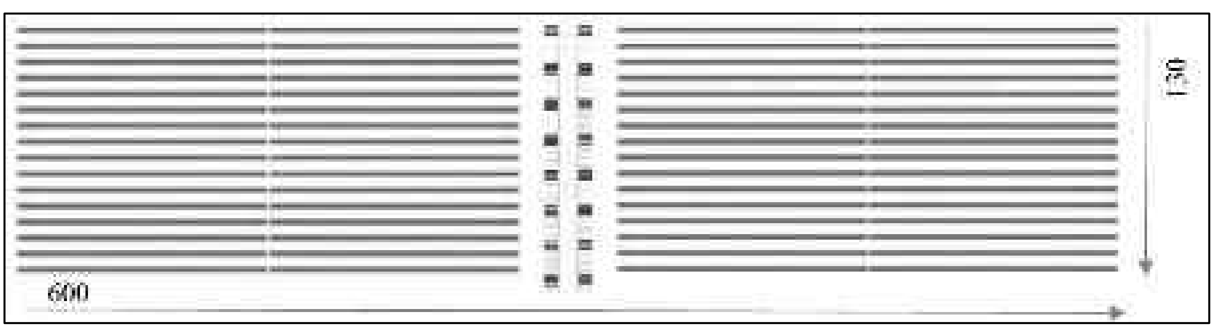
Table 14: Uliastai solar PV farm indicative parameters.

Solar modules	16,512 modules Pn 300 Wp+1% tier one mono-crystalline, 1650 x 952 x 35 mm	
Array	**Location:**	N 47.682 / E 96.557
	Direction:	Azimuth -25°W Inclination 47°
	Mounting	Modules in 4 groups of 16 rows
	Perimeter:	600 m x 100 m
Inverters	32 string inverters 150 kW	

Source: PPTA consultant, 2017.

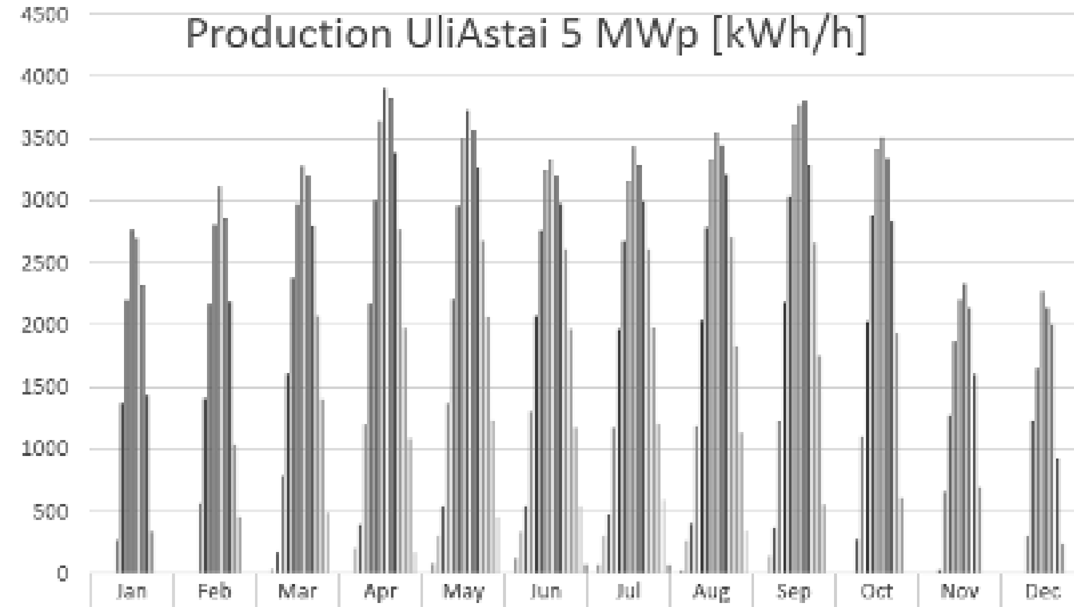
82. Battery storage will be used to reduce the impact of the variability of intermittent generation (**Figure 11**).

Figure 9: Facility layout, Uliastai solar PV farm.



Source: PPTA consultant, 2017.

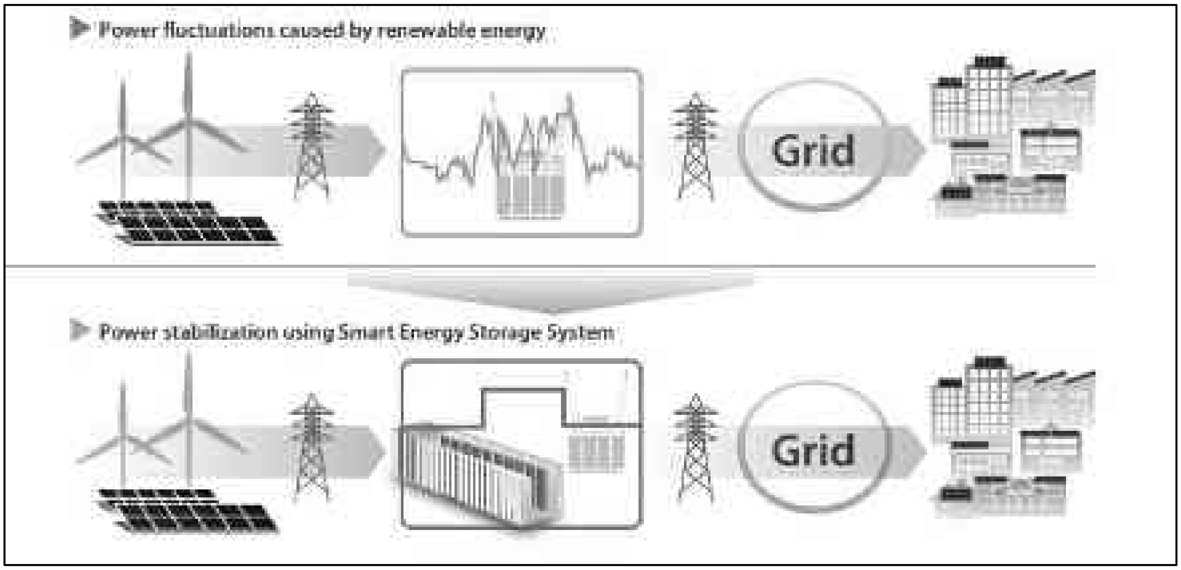
Figure 10: Uliastai solar PV farm estimated production (kWh/hr).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
04:00	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	0	0	0	0	0	0	0
06:00	0	0	0	4	79	122	69	22	0	0	0	0
07:00	0	0	35	204	302	336	303	263	141	9	0	0
08:00	0	5	171	395	539	542	476	402	369	276	28	0
09:00	268	563	787	1202	1367	1302	1174	1187	1226	1100	659	300
10:00	1371	1412	1610	2172	2213	2075	1966	2034	2187	2029	1276	1228
11:00	2201	2170	2384	3002	2962	2761	2677	2788	3035	2885	1865	1652
12:00	2764	2799	2975	3644	3496	3242	3162	3328	3609	3419	2199	2262
13:00	2699	3119	3285	3906	3729	3329	3439	3551	3773	3510	2334	2142
14:00	2314	2856	3189	3826	3562	3194	3283	3444	3800	3338	2139	2003
15:00	1436	2189	2800	3392	3269	2980	2997	3217	3290	2839	1605	923
16:00	338	1035	2074	2771	2682	2608	2607	2708	2661	1934	696	240
17:00	9	453	1400	1977	2064	1966	1984	1829	1754	611	0	0
18:00	0	0	490	1086	1227	1175	1204	1133	556	0	0	0
19:00	0	0	0	168	456	542	593	344	0	0	0	0

Source: PPTA consultant, 2017.

Figure 11: Conceptual diagram illustrating how battery storage stabilizes power from renewable energy sources.



Source: Panasonic Corp, 2017.

83. Lithium-Ion (Li-Ion) batteries or other advanced technology batteries that can stand low temperature will be utilized. Li-Ion batteries utilize the exchange of lithium ions between electrodes to charge and discharge the battery. Rechargeable Li-Ion batteries are commonly found in consumer electronic products such as cell phones and laptops, and are the standard battery found in electric vehicles. In recent years this technology has developed and expanded its portfolio of applications considerably into utility-scale applications. Today, Li-Ion batteries have been routinely implemented for applications relating to ancillary services in grid connected storage. A 1.0 MW battery system capable of storing 3,600 kWh will be installed, with a cycle life of 4,400 times and a guaranteed dischargeable energy of 14,520 MWh (3,300 kWh x 4,400 cycles).

Figure 12: Example of 2 MW lithium ion battery system.

Source: Meidensha Corp, 2017.

84. An energy management system will control the battery system, including forecast of load demand and PV output; recording of power input from PV and other renewable sources, and power supplied to grid; supervision of battery and connection point (monitoring point) with grid; and prevention of backflow of power to the battery from the grid.

85. Battery storage will also reduce high-carbon imports by charging batteries with low cost energy and substituting high-carbon imported energy with discharged battery energy. Charging of the battery at Uliastai will be by night-time hydropower from Bogdiin gol small hydro power plant (SHPP) in the summer months and by early morning hydropower-based import from CES in the winter months.

86. The Bogdiin gol SHPP is a 2 MW run-of-the-river plant located on the Bogdiin River in Zavkhan Aimag, 30 km east of Uliastai City. It was initially commissioned in 1997, and is currently operated by the Uliastai Energy Company, which is owned by the Zavkhan Aimag government.

87. The Bogdiin gol SHPP was rehabilitated from 2005 until 2008 with financial support from KfW. The maximum annual generation, which was 1.5 million kWh before the rehabilitation, was increased to a potential 9 million kWh. The SHPP utilises a reservoir created by a small concrete weir, and includes a fish ladder (one of only three fish ladders in Mongolian hydropower plants). The power plant typically only operates between May and October due to winter river freezing.

Figure 13: Layout of Bogdiin gol run-of-the-river SHPP, Bogdiin River, Zavkhan Aimag.

Source: Bing maps, 2018.

Figure 14: Bogdiin gol run-of-the-river SHPP weir and fish ladder.

Source: FAO, Workshop on Fish Passage Design at Cross River Obstacles – Experiences from Different Countries, with Potential Relevance to Mongolia, 2014.

88. The wind farm will connect to the existing Aldarkhaan Soum substation via a dedicated 3 km long 35 kV OPL.[6] The substation is an associated facility of the subproject. It is located on the eastern perimeter of Aldarkhaan Soum town, and was built in 2008 (**Figure 15**). It is a 35/10 kV substation and includes a 10 kV feed to the airfield and a 35 kV line to Uliastai Soum. It is operated by the Altai-Uliastai Power Company.

89. A 10 MVA transformer will be installed within the substation. The AuES SOJSC has reviewed the proposed works and raised no objections since the new transformer will be located within the existing substation yard. The MoE will issue a Technical Condition document that specifies the connection standards that must be met by the contractor.

Figure 15: Aldarkhaan 35/10 kV substation.

Source: PPTA consultant, 2017.

90. There are no sensitive receptors adjacent to the substation, and there are no known public complaints about its operation.

F. Govi Altai 10 MW Solar PV

91. A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag. The capital is officially named Yesonbulag Soum, and should not be confused with the separate soum in the south of the Aimag also named Altai (see Altai Soum subproject, below). Altai City has a population of about 20,000 and is a prospering commercial center.

92. The PV farm will be located on a 25-ha site along the paved road from Khovd, north of the Altai Airport, and 1.5 km from the edge of Altai City, in Jargalant Bahg (**Figure 16**).

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[6] The OPL specifications will be the same as in the Umnugovi subproject.

Figure 16: Solar PV farm location, Jargalant Bahg, Altai City, Yesonbulag Soum, Govi-Altai Aimag.

Source: PPTA consultant, 2017, and Google Earth, 2017.

93. The 10 MW PV farm will consist of 33,024 mono-crystalline PV panels mounted 3 horizontally per structure on rammed, double pole support structures in 142 m long rows. The solar panels will be mounted high enough to be clear from snow accumulations in winter. They will be tilted at a fixed angle selected to emphasize maximum production towards the load peaks in afternoons and in the winter seasons. A drainage and rain water collection system will be included to provide site drainage and flood protection, and avoid relying on municipal water for panel cleaning.

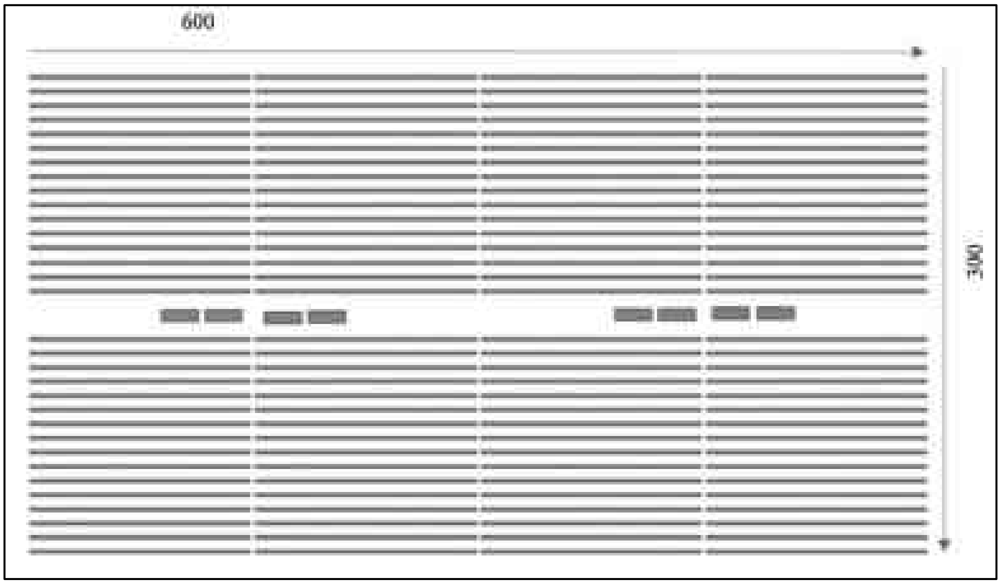
94. Every 16 rows of panels will form a group connected to a 1.25 MW inverter, and there will be a total of 8 PV panel groups. The solar panel strings will be connected in vented collector boxes from which ground cables will lead to the inverters. The inverters will step up voltage into the feeder line. **Figure 17** presents the solar PV farm layout while **Table 15** presents indicative design parameters for the farm. **Figure 18** presents an estimation of the plant´s electricity production, based on PVGIS-SARAH online irradiation database, and is subject to individual module and inverter performance parameters.

Table 15: Govi Altai solar PV farm indicative parameters.

Solar modules	33,024 modules Pn 300 Wp+1% tier one mono-crystalline, 1650 x 952 x 35 mm	
Array	**Location:**	N 46.387 / E 96.211
	Direction:	Azimuth -20 °W Inclination 46°
	Mounting	Modules in 8 groups of 16 rows
	Perimeter:	600 m x 300 m
Inverters	8 central 1.25 MW inverters	

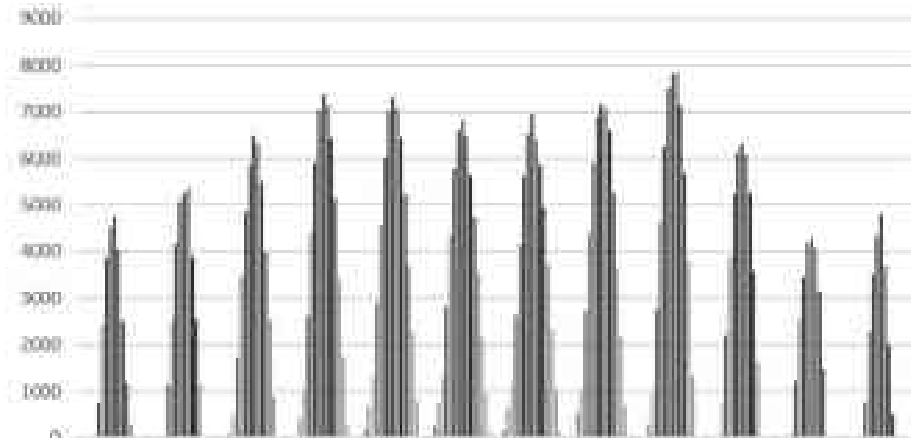
Source: PPTA consultant, 2017.

Figure 17: Facility layout, Govi Altai solar PV farm.



Source: PPTA consultant, 2017.

Figure 18: Govi Altai solar PV farm estimated production (kWh/hr).



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06:00	0	0	0	0	164	243	183	27	0	0	0	0
07:00	0	0	77	419	657	338	624	547	112	38	0	0
08:00	0	19	455	1085	1322	1387	1332	1048	1012	711	92	0
09:00	747	1131	1732	2625	2918	2809	2630	2708	2753	2211	1212	768
10:00	2431	2525	3454	4284	4551	4358	4163	4385	4616	3873	2527	2260
11:00	3868	4155	4857	5911	6010	5780	5625	5899	6243	5238	3464	3524
12:00	4540	5088	5854	7028	7022	6561	6516	6002	7501	6103	4197	4340
13:00	4767	5248	6483	7363	7285	6815	6944	7166	7823	6295	4329	4815
14:00	4048	5351	6318	7158	7158	6482	6400	7066	7832	6074	4054	3704
15:00	2506	3882	5486	6423	6438	5616	5874	6992	7123	5267	3148	1994
16:00	1192	2553	3996	5148	5225	4705	4947	5251	5670	3575	1407	533
17:00	303	1140	2516	3416	3893	3453	3726	3647	3793	1614	10	0
18:00	0	9	871	1741	2224	2143	2335	2152	1315	0	0	0
19:00	0	0	0	270	812	945	1025	711	0	0	0	0
20:00	0	0	0	0	0	144	136	0	0	0	0	0

Source: PPTA consultant, 2017.

95. The solar farm will connect to an existing 35 kV overhead line supplying the Altai Airport via a step-up transformer and a 150 m long OPL. The airport line capacity is 15 MW; this capacity is adequate for the foreseeable future. The line is operated by the AuES SOJSC.

G. Altai Soum Hybrid Solar and Wind

96. An off-grid 500 kW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag soum), the capital of Govi Altai Aimag (**Figure 19**).

97. Altai Soum is supplied by an off-grid electricity supply system consisting of a 311 kW PV station and three diesel generator sets with a total capacity of 220 kW (2 x 60 kW and 1 x 100 kW). The system supplies a total of 246 private households and 41 other buildings including government agencies, a school, small businesses, a dormitory, a hospital, a police station, banks and a mobile phone network station. The soum is geographically isolated from the northern part of AuES by a mountain range. The PV station is no longer operating at design capacity because the battery bank has reached the end of its useful life. The subproject will install a new 500 kW

wind power and rehabilitation of the batteries in an existing solar PV farm to accommodate increased demand.

Figure 19: Altai soum in relation to Altai City (Yesonbulag).

Source: PPTA consultant, 2017, and Google Earth, 2017.

Condition of Existing Electricity Supply System

98. The existing solar PV-station was installed in 2010, financed by the World Bank. The initial installed capacity of the station was 202.5 kWp capacity, consisting of 1,500 PV modules, a battery bank, and control devices. In 2016 an additional 640 PV panels with 108.8 kWp was put in place, giving a total installed capacity of approximately 311.3 kWp. However, as a result of equipment failure approximately 700 panels have been disconnected.

99. The original battery system consisted of 4 battery arrays, with each array comprising 120 2V/2500 Ah batteries for a total storage capacity of 10,000 Ah. All of the batteries were installed in 2007 and have reached the end of their usable lifetimes, mainly due to poor practice deep discharging of the batteries. The battery capacity (Ah) is sufficient to produce the power of the associated PV module for a period of 8 hours at a discharge level of 50%. There are 11 charge controllers (inverters for power conversion) of which 3 are damaged for unknown reasons. During subproject implementation, corrective actions will be taken for non-compliance of used battery disposal. All used batteries shall be disposed following the requirements in the EMP.

100. The PV-station personnel are also responsible for the operation of the three diesel generation sets that operate every morning from 6:30 am until 8:30 am, and again in the evening from 19:30 pm until 24:00 pm.

101. The PV station requires the full replacement of the battery bank and inverters.

Figure 20: Existing power plant**,** Altai Soum.

Source: Bing Maps 2017.

Figure 21: Existing 200 kW PV farm as seen from Altai Soum.

Source: PPTA consultant, 2017.

Figure 22: Altai Soum existing 200 kW PV farm.

Source: PPTA consultant, 2017.

Condition of Existing Distribution Network

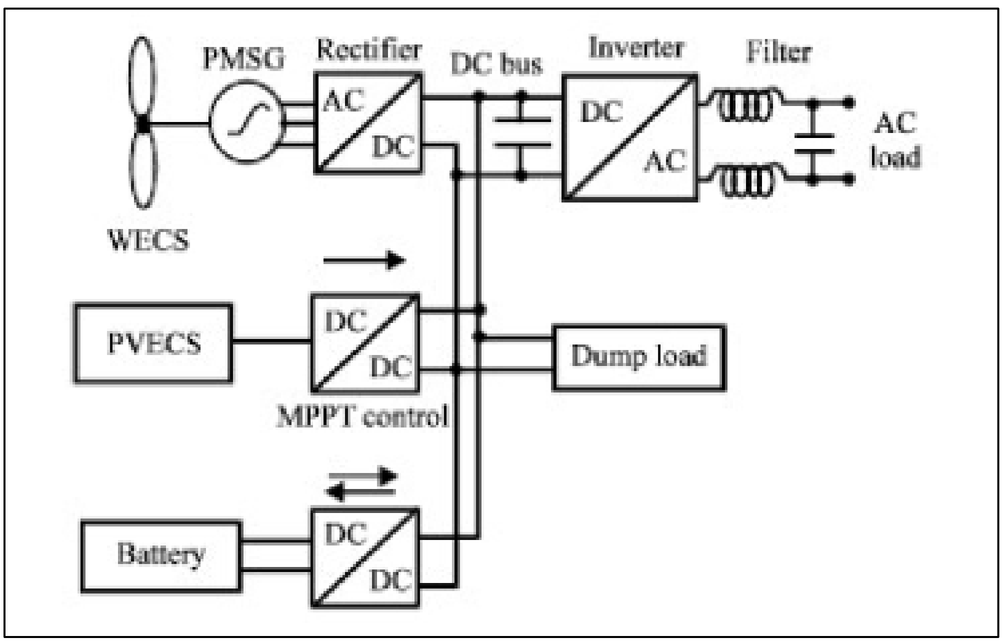
102. The soum distribution grid has three 400 V circuits, each connected to separate inverters and the diesel genset in the PV-station. There are single phase lines of unequal loading creating high unbalance between phases, particularly in the evenings, and accordingly technical losses are high. The distribution grid was installed before 1990 and is in poor condition.

Proposed Hybrid Renewable Energy System

103. The subproject will improve the standard of electricity supply provision to the Altai soum by installing a new 500 kW wind power and rehabilitation of the batteries in an existing solar PV farm (details see para 152-155). The hybrid system will operate in a coordinated manner with charging of the batteries determined by a control algorithm according to a user-defined operating regime. Diesel generation will act as a standby reserve for emergency night-time use. It is expected that diesel generation will only be called upon rarely to operate in the event that the batteries reach a 50% discharge level and no wind is available. A drainage and rain water collection system will be included to provide site drainage and flood protection, and avoid relying on well water for panel cleaning.

104. The hybrid system will include a new 500 kW small scale wind farm located about 1.2 km north east of the town limit, and 600 m to the north of the existing solar PV farm, at coordinates 44°37’26.5”N and 94°55’36.3”E, at an elevation of 1,450 masl. The site is situated on abandoned air landing strip that was last used 27 years ago and is now considered too close to the settled area for safe usage (**Figure 24** and **Figure 25**). The expected wind direction in that area is from the west and north and the site is very open to the dominant winds. The wind farm will consist of two 250 kW wind turbines with a hub height of 40 to 50 m and a rotor diameter of 30 m (**Figure 26**).

Figure 23: Conceptual design, Altai Soum hybrid RE system.



Source: PPTA consultant, 2017.

Figure 24: Wind farm site in relation to existing solar farm, Altai Soum hybrid renewable energy system.

Source: PPTA consultant, 2017 and Google Earth, 2017.

Figure 25: Site conditions at proposed wind farm site, Altai Soum hybrid renewable energy system.

Source: PPTA consultant, 2017.

Figure 26: Example of a Wind Technik Nord WTN 250 kW wind turbine.

Source: Wind Technik Nord WTN 2017.

H. Khovd Shallow-ground Heat Pump

Introduction

105. A 132 kW Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag. Khovd City has a population of over 30,000.

106. Kindergarten 1 is one of eleven sites that were examined in Khovd as part of a PPTA GSHP study, and it was selected from a short-list of five based on factors including the building owner's available land for installation; insulation and weatherization undertaken; age and condition of buildings indicating a life expectancy of more than 10 years; and the amount of coal burned for heating. Kindergarten 1, under construction during the appraisal process, was selected due to its high energy efficiency design with insulation and sealed windows. This building will become a pilot site for GSHP, and will inform the case for installing GSHPs at the four other Aimag capitals in phase two.

107.

Shallow-ground Heat Pumps

108. A GSHP systems consist of a heat pump system (heat pump units and ancillary equipment such as pumps, heat exchangers, pipes etc.) and a ground heat exchanger. The ground heat exchanger component can account for up to half of the total system cost, and is the most cumbersome part to repair or replace. GSHPs are suitable for small domestic applications to large multi-megawatt industrial solutions.

109. Shallow-ground heat exchangers can be divided into two main types – shallow (1.0–2.5 m) horizontal heat exchangers and deep (15–175+ m) vertical systems. Deep vertical systems are divided into closed loop systems, which use a mixture of anti-freeze (e.g. propylene glycol) and water as a heating media, and open loop systems which use natural groundwater as a heating media.

110. The GSHP study determined that the preferred ground heat exchanger type in Khovd is a deep vertical closed loop heat exchanger, as the ground freezing level in Khovd is deeper than 3.2 meters, beyond the typical installation depth of horizontal heat exchangers, and test bore holes did not encounter sufficient groundwater resources for an open loop system.

111. The GSHP study also undertook a capacity optimization analysis for GSHPs and other possible supplementary technologies in Khovd, including coal and electric boilers, and solar thermal collectors. It concluded that that GSHP technology is preferred (technically and economically) for base load heat supply capacity in public buildings, but coal or electric boilers are still required for peak and reserve capacity.

Kindergarten 1 GSHP

112. Kindergarten 1 is a recently constructed two story building located in Takhilt Bahg, an urban Ger area in southern Khovd city (**Figure 27** and **Figure 28**). It will have approximately 150 students and 17 staff, and will require heating for approximately 1,700 m^2 of floor space. Kindergarten 1 has been constructed following relevant national regulations.

113. **Table 16** presents Kindergarten 1 building characteristics, and **Table 17** presents the building heat demands.

Table 16: Kindergarten 1 building characteristics.

Item	Unit	Value/Description
Building type/use		2 story school
Volume of building	m^3	9,619
Construction material		Frame, concrete units, insulated with foam sheet plate board
Year of commencement		October 2017
Owned land area	m^2	3,000
Spare area of land	m^2	2,200
Current heating system		District Heating (anticipated)
Annual coal consumption	t/year	NA
Cost of coal	MNT/t	NA
Total inhabitants	persons	167

Source: PPTA consultant, 2017.

Table 17: Kindergarten 1 heat demands.

Parameter	Unit	Heat Demand
Max demand	kW	256.4
Annual demand for space heating	MWh	684.7
Annual demand for domestic hot water	MWh	69.3
Total heat demand	MWh	754.0
Load factor (total heat demand)	%	34

Source: PPTA consultant, 2017.

Figure 27: Location of Kindergarten 1, Khovd City.

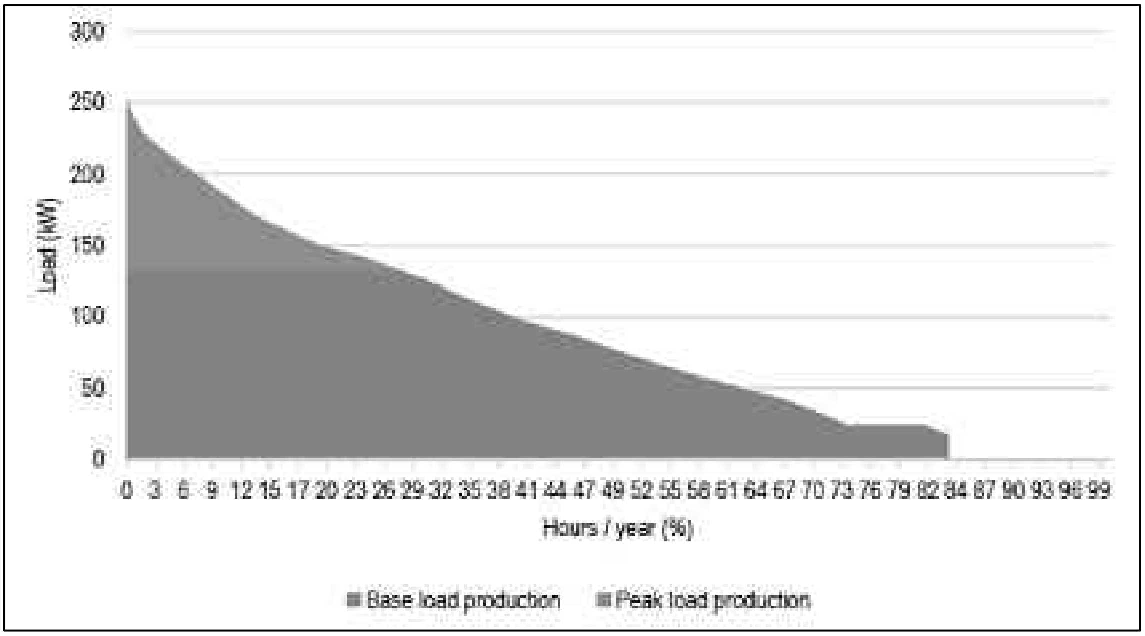
Source: PPTA consultant, 2017 and Google Earth, 2017.

Figure 28: Kindergarten 1 nearing construction completion, October 2017.

Source: PPTA consultant, 2017.

114. The Kindergarten 1 GSHP system will be a hybrid, with a 132 kW closed vertical loop with 170 m deep bore holes. The World Bank *EHS Guidelines for Geothermal Projects* will be followed to minimize the impacts of drilling fluids and cuttings, etc. The heat pump will be responsible for up to 86% of the annual energy supply (e.g. base load), and an existing small 240 kWth heat only coal boiler will cover the remaining 14% (peak load) and reserve capacity (**Figure 29**).

Figure 29: Preferred capacity mix for the GSHP system.



Source: PPTA consultant, 2017.

115. According to the Development and Planning Department of Khovd Aimag, the boiler was installed with all appropriate approvals in compliance with relevant Mongolian regulations (**Table 18** and **Figure 30**).

Table 18: Khovd Kindergarten Boiler.

Boiler manufacturer:	Odkon Co. Ltd, Mongolia	
Model:	NR45J	
Heat output:	240,000 kcal/hour	
Coal consumption per hour:	65 kg/hour	
Coal to be fired:	Hard coal	
Coal Proximate Analysis:	Moisture %	19.0 - 18.0
	Ash %	18.0 - 23.0
	Volatile Matter %	34.5 - 33.8
	Sulfur %	0.9 - 0.4
	Hydrogen %	4.3 - 3.2
	Heating value, kcal/kg	3750 - 3587

Source: Mr. B.Tumendemberel, Officer of Development and Planning Department, Khovd Aimag, 2018.

116. **Figure 31** presents a schematic of the GSHP system, illustrating how the heat pump will be supplemented by the peak and reserve capacity coal boiler and solar thermal collectors. The maximum supply temperature of a GSHP is typically to 65 to 70°C, which can be met by the heat pump. However, during periods of extreme cold weather, a higher supply temperature will be required, and the peak boiler will be connected in series with the heat pump so as to increase the supply temperature to the required level. It should be noted that the GSHP has been dimensioned to be relatively large (132 kW, 51% of the peak demand) thereby minimizing the need for the peak

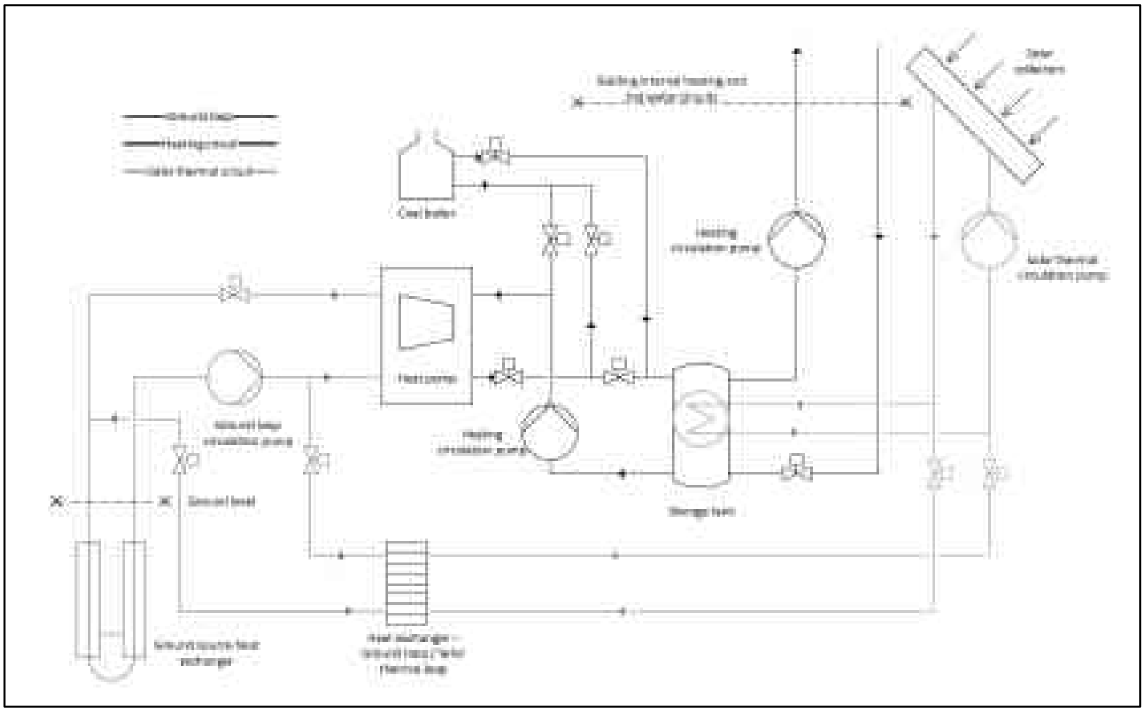
boiler. It is estimated that the peak boiler will only be needed for a maximum of 15 days per year, when the temperature is below -30 °C.

117. Solar thermal collectors will be utilized to produce domestic hot water in the summer time, and more importantly, to re-charge the ground loop by solar heating during the summer, which improves the efficiency of the GSHP and prolongs the geological age of the thermal well.

Figure 30: Khovd Kindergarten Boiler.

Source: Mr. B.Tumendemberel, Officer of Development and Planning Department, Khovd Aimag, 2018.

Figure 31: GSHP system schematic.



Source: PPTA consultant, 2017.

I. Implementation Arrangements

118. The MOE will be the EA. A project steering committee, composed of MOE, Ministry of Finance, and IAs, will be established to provide overall guidance on project management and implementation. A project management unit (PMU) under MOE will be responsible for managing, coordinating, and supervising the implementation of all subcomponents.

117. The NREC will be the IA for GSHP projects. Project implementation unit (PIU) will be establish by the IA for the implementation of the subproject.

J. Implementation Period

118. The Project will be implemented over 60 months from June 2018 to June 2023.

K. Project Cost

119. The project has an estimated budget of $66.31 million (**Table 19**).

Table 19: Estimated Project budget ($ millions).

Item		Amount[a]
A.	**Base Cost**[b]	
	1. Distributed renewable energy system development	**53.94**
	a. Umunogovi wind power	15.61
	b. Altai solar PV	11.05
	c. Altai soum renewable energy hybrid system and battery storage	1.05
	d. Uliastai solar PV and battery storage	9.05
	e. Telmen wind power	6.85
	f. Moron solar PV	10.33
	2. Shallow-ground heat pump system development	**1.14**
	3. Institutional strengthening and capacity enhancement	**1.76**
	Subtotal (A)	**56.84**
B.	**Contingencies**[c]	**4.04**
C.	**Financial Charges during Implementation**[d]	**5.35**
	Total (A + B + C)	**66.23**

PV = photovoltaic.
Note: Numbers may not sum precisely because of rounding.
[a] Includes taxes and duties of $5.63 million. Such amount does not represent an excessive share of the project cost. The government will finance taxes and duties through exemption.
[b] In March 2018 prices.
[c] Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average of 3.9% on foreign exchange costs and 20.3% on local currency costs; include provision for potential exchange rate fluctuation assuming a purchasing power parity exchange rate.
[d] Includes interest and commitment charges. Interest during construction for the loan from ordinary capital resources has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for this loan are 0.15% per year, to be charged on the undisbursed loan amount.
Source: Asian Development Bank estimates.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Mongolia

120. Mongolia is a landlocked country in east-central Asia bordered by Russia to the north and China to the south, east and west. It has an area of 1,564,116 km^2, an average elevation of 1,580 masl, and a population of 3.064 million. With a population density of 1.95 inhabitants per km^2, Mongolia is the most sparsely populated country in the world. Much of the southern portion of the country is taken up by the Gobi Desert, while the northern and western portions are mountainous (**Figure 32**).

Figure 32: Topography of Mongolia.

Source: http://www.mongols.eu/maps-of-mongolia/thematic-maps/.

121. Mongolia has a northern continental climate characterized by long, cold winters, short summers, and an average of 257 cloudless sunny days a year. Precipitation is highest in the north, averaging 200 to 350 mm annually, and lowest in the south, averaging 100 to 200 mm annually. More than 60% of precipitation falls in the summertime. With wintertime temperatures regularly below -30°C, Mongolia is among the coldest countries in the world.

122. Since 1990 Mongolia has successfully transitioned from a centrally-planned economy into one of the world's fastest growing market-oriented economies. Mongolia has significant mineral resource wealth estimated at US$ 1-3 trillion, with coal, copper, and gold being the principal reserves. Mining is the most significant sector of the economy, accounting for 20% of total output, and commodities constitute 82% of total exports. China is Mongolia's main export destination. Due to a lack of diversification in export products and a heavy reliance on foreign capital inflows to meet its investment needs, Mongolia is susceptible to volatile mineral market cycles.

123. Mongolia's political system is a parliamentary republic. Administratively Mongolia is divided into 21 aimags or provinces, and 331 soums or districts. Soums are further subdivided into bahgs, the lowest level of administrative subdivision. While soums always have a permanent settlement as administrative centers, many bags don't. The capital Ulaanbaatar Region is the largest city, and home to 45% of the population. It is administrated as an independent municipality.

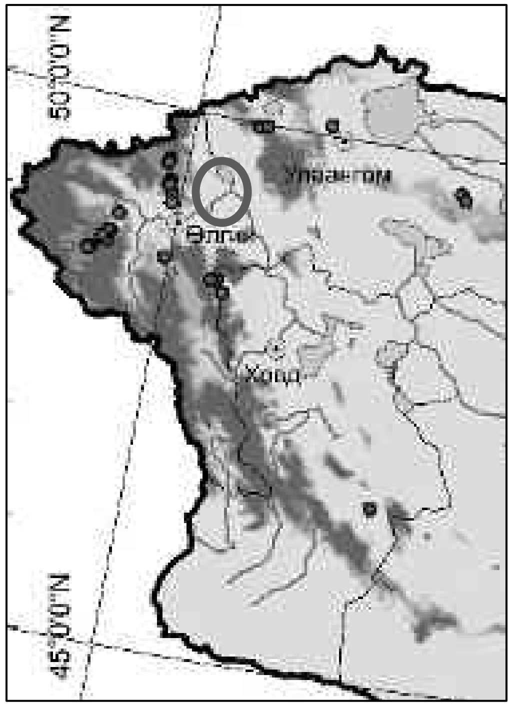
124. The targeted aimags for the core subprojects (Uvs, Govi-Altai, Zhavhan and Khovd) are the less developed with respect to educational attainment, life expectancy, and monetary income than other areas of Mongolia. Average Human Development Index (HDI) in these regions is around 0.657 whereas HDIs in national average and in Ulaanbaatar are 0.735 and 0.812 respectively.

B. Subproject Environmental Settings

125. The following sections describe the environmental setting of each subproject. The descriptions are based on screenings utilizing the IBAT developed by BirdLife International, Conservation International, IUCN and UN Environment's World Conservation Monitoring Centre; site visits conducted by domestic and international environmental consultants; field surveys conducted by domestic environmental and biological consultants; and consultations and data collected from the local State Environmental Inspectorates.

126. According to the latest Mongolia Permafrost Distribution Map, all subproject sites are located in seasonal freezing areas and there is no significant permafrost in the subproject areas.

Mongolia permafrost distribution map 2016.



Source: Y. Jambaljav et.al., 2016.[7]

127. Field surveys were undertaken in June and October 2017 as part of the preparation of the DEIA by Sunny Trade Co. Ltd. LLC. The survey team consisted of:

- Mr. Togtokhnyam B., Mining Economist
- Prof. Urtnasan B., Botanist and Vegetation Expert
- Dr. Mandakhbayar J., Soil Expert
- Master Enkhtuya M., Hydrologist - Water Expert
- Dr. Namkhaijantsan G., Climatologist – Meteorological Expert
- Batsuren B., Land Expert
- Erdenebayar A., Geographical Expert
- Mijiddorj B., Wildlife Expert
- Saruultuya L., Soil and Waste Management Expert
- Ms. Erdenejargal D., Expert on EIA
- Ms. Narangerel B., Expert on EIA

128. Field studies and data collection included:

- Vegetation survey and condition assessment
- Wildlife survey
- Geology, topography, and soil profile and sampling

[7] Jambaljav, Y., Y. Gansukh, H. Temuujin, G. Tsogt-Erdene, Ts. Undrakhtsetseg, A.Vgjeekzaya, Y. Amarbayasgalan, A. Dashtseren, Sh. Narangerel, 2016. Institute of Geography. Ulaanbaatar.

- Surface and ground water sampling and assessment
- Climatological secondary data collection (including temperature, rainfall, wind, etc.)
- Waste management secondary data collection and field assessment
- Landuse
- Surface and groundwater resources, and flood risks
- Air quality and noise quality
- Earthquake and hazards risk assessment
- Parks and protected areas
- Socioeconomic profile
- Sensitive receptors including PCRs

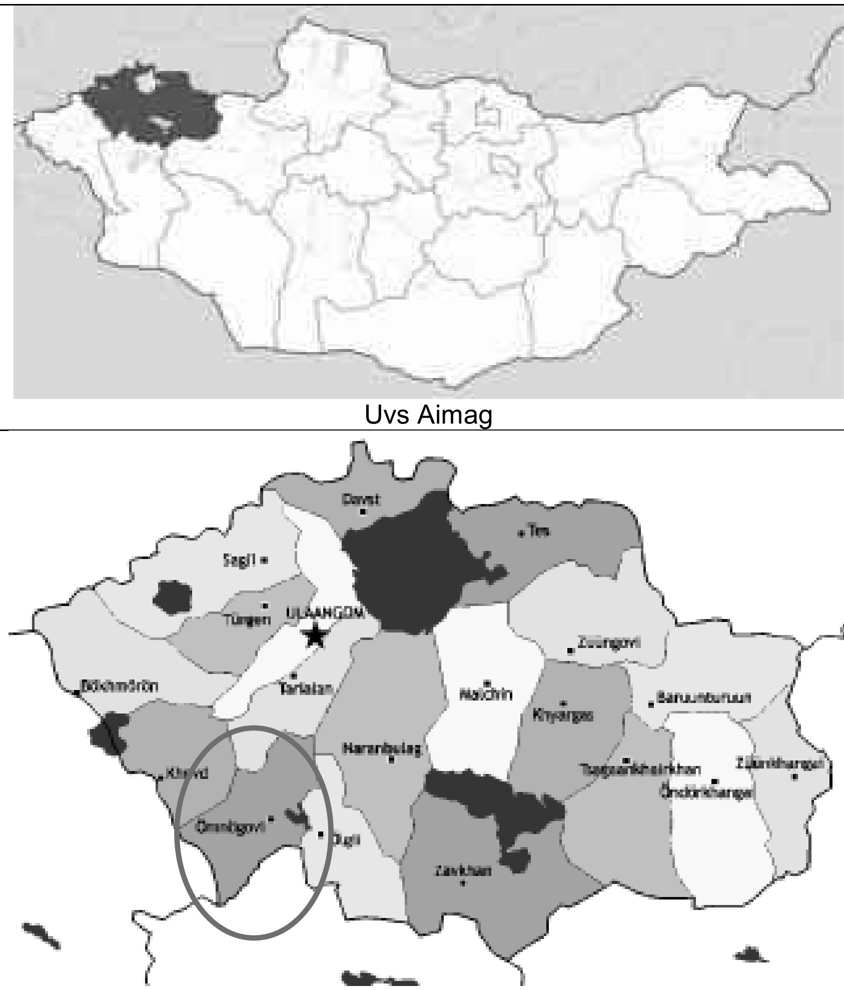
C. Umnugovi

1. Physical Resources

a) Geography and Topography

129. Umnugovi Soum is located in Uvs Aimag in northwestern Mongolia. The soum is situated in the southwestern portion of the Aimag (**Figure 33**).

Figure 33: Location Uvs Aimag and Umnugovi Soum.



Uvs Aimag

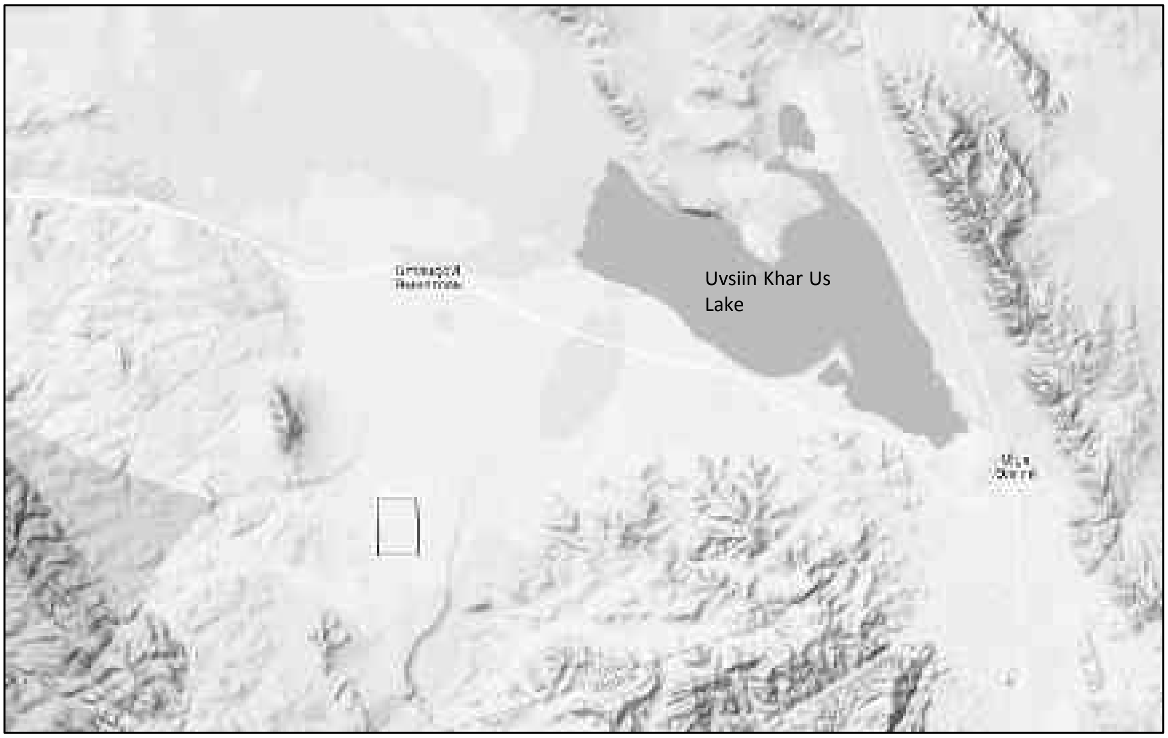
Umnugovi Soum.

Source: Wikipedia, 2017.

130. The wind farm will be located near the existing Umnugovi substation within Namir Bahg, approximately 8.8 km from the soum center (Umnugovi town) (**Figure 4**). The site is situated on a large flat outwash plain at an elevation of 1,615 masl. There are mountainous areas to the north and south, and a shallower ridge to the east past Uvsiin Khar Us Lake (

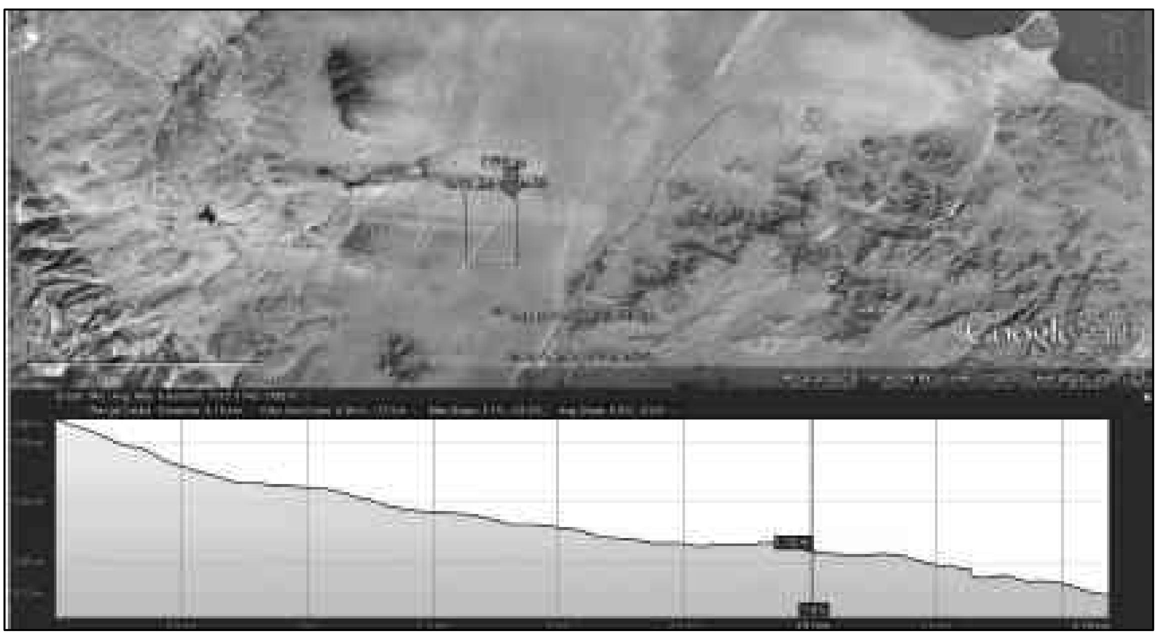
131. **Figure 34**). Site topography is generally flat, sloping slightly down to the northeast towards Uvsiin Khar Us Lake, which has an elevation of 1,571 masl (**Figure 35** and **Figure 36**).

Figure 34: Topography in the general area, Umnugovi wind farm site.



Source: Google Maps, 2017.

Figure 35: Umnugovi wind farm site topographical profile.



Source: Google Earth, 2017.

Figure 36: Site conditions at Umnugovi substation.

Source: PPTA consultant, 2017.

b) Land Use

132. The land at the site is not currently used or occupied other than the substation. Site visits by the PPTA consultants and interviews on land acquisition and resettlement with local authorities and the energy system representatives confirmed that WES company possesses a 10 ha land license for the subproject. There are no residences or other structures in the subproject area.

c) Soils

133. Site soils are typical of valleys in the area, semi-desert rocky grey and brown sandy clay loams. As part of the DEIA investigations 11 soil sections were dug to assess site soil properties, and 21 samples were taken for laboratory analysis at the Soil Laboratory, Institute of Geography and Geoecology, Academy of Sciences.

134. Soil section 16-13 is representative of the site:

0 to 1.8 cm	Rocks, pebbles, and sand
1.8 to 15 cm	Reddish brown sandy soil with loose formation
15 to 30 cm	Faded brown in color, dense, with limited plant roots, loose pulverescent texture, light clay close to sand, fully carbonated and reactive to hydrochloric acid
30-50 cm	Light brown in color, moist, dense, light clay, loose pulverescent texture, fully carbonated, thin pale crust under the small rocks

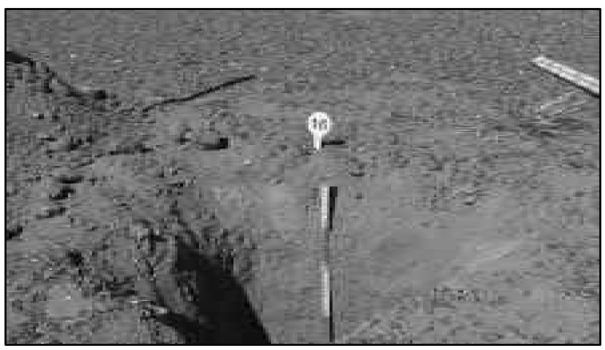
Table 20: Chemical and physical properties of soils at Section 16-13, Umnugovi site.

Sampling depth, cm	**Humus, %**	**$CaCO_3$ %**	**pH**	**EC $_{2,5}$ ds/m**	**Dynamic element per 100 g soil, mg**		**Mechanical particles,% (size of particles, in mm)**		
					P_2O_5	K_20	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
Site description: Section 16-13, desert steppe brown sandy clay loam covered by rocks									
0 - 20	1.089	000	7.87	0.115	1.17	9.2	61.3	20.7	18.0
20 - 60	0.837	7.27	8.28	0.199	0.93	6.2	64.2	21.7	14.1

Source: Institute of Geography and Geoecology, 2017.

135. The humus content is low in the upper layers at 1.089% and decreases sharply with depth. Soil carbonates are not found in the upper layers, while soils from 20-60 cm are alkaline with a pH of 8.28. Electrical conductivity is higher in the lower layers reaching 0.199 ds/m. The content of phosphorus and potassium, important nutrients for vegetation, is moderate to very low. As for soil separates, all layers are dominated by sand ranging from 61.3 to 64.2%.

Figure 37: Soil section 16-13, Umnugovi.

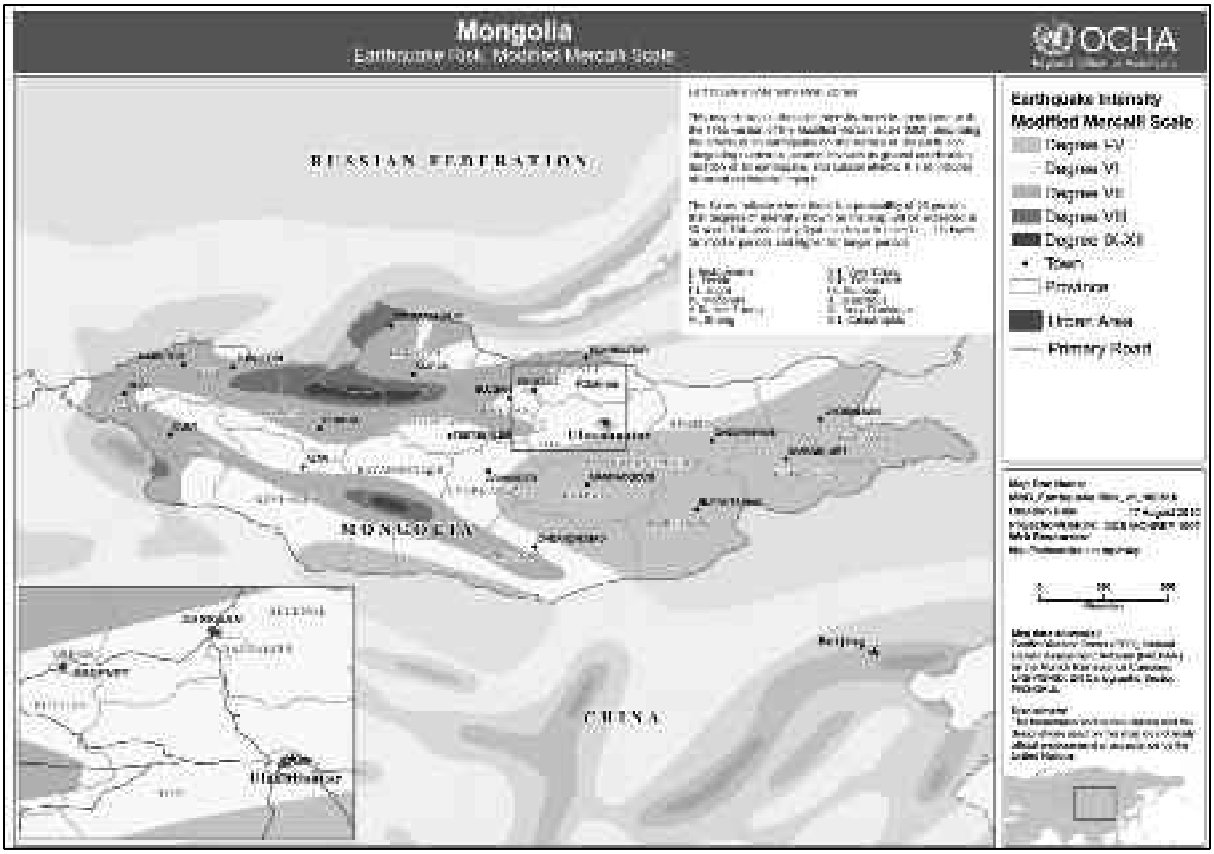


Source: PPTA soil expert, 2017.

d) Earthquake Risks

136. According to the Mongolia earthquake risk Modified Mercalli scale map produced by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the site is at a transition between a Degree VI zone and a Degree VII zone (**Figure 38**). The map shows earthquake intensity zones in accordance with the 1956 version of the MM scale, describing the effects of an earthquake on the surface of the earth and integrating numerous parameters such as ground acceleration, duration of an earthquake, and subsoil effects. It also includes historical earthquake reports. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods. The map indicates that the site is not in the high risk areas of Western Mongolia (e.g. Degree IX and above).

Figure 38: Mongolia earthquake risk Modified Mercalli (MM) scale map.



Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA), 2010.

137. According to the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR) hazard screening tool ThinkHazard, the site is in a medium earthquake hazard risk zone, meaning that the potential impacts of earthquakes should be considered during design and construction.[8]

e) Climate

138. Umnugovi Soum has a northern continental climate characterized by long cold winters and short moist summers (**Figure 39**). The average annual temperature is -1.2˚C. The coldest month is January with an average low temperature of -28.4˚C and a lowest recorded temperature of -45.5˚C. The hottest months are July and August with an average high temperature of 22.5˚C and a maximum recorded high of 38.9˚C.

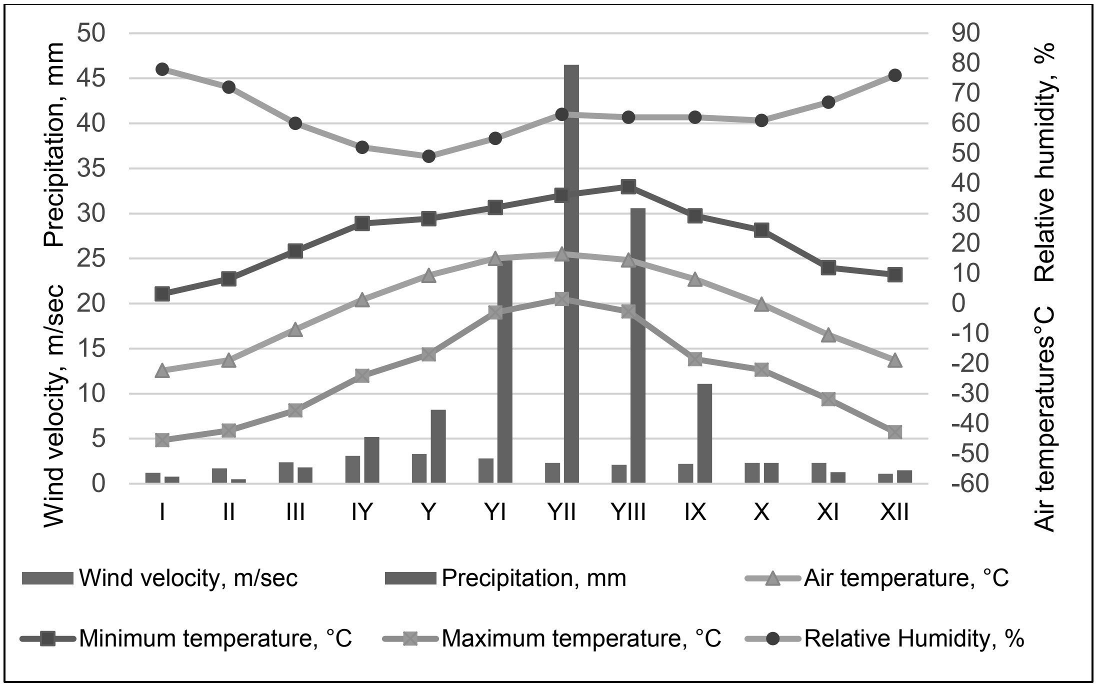
139. Average annual relative humidity is 63% which is relatively dry, and average annual precipitation is only 135 mm; 100 mm in the southern part of the soum, 112-150 mm in mountainous areas and more in the windward sides of high mountains. Approximately 75% of average annual precipitation falls in summer months.

140. The site area receives an average of 2,925 hours of sunlight per year. Average daily sun

[8] GFDRR: www.gfdrr.org.

shine ranges from 4.7 - 5.4 hours in winter and 9.4 - 9.8 hours in summer.

Figure 39: Umnugovi climatogram.



Source: PPTA climate expert, 2017.

141. Wind characteristics in the site area are influenced by regional and local topography. The predominant wind direction is from the west (**Table 21** and **Figure 40**). Annual mean wind speed, which is not dependent on wind direction, is 2.2 m/s. Average wind speed ranges from 2.1 - 2.3 m/s in autumn, 3.1 - 3.3 m/s in the windiest months of April and May, and 1.1 - 1.7 m/s in winter from December to February. Westerly and southeasterly winds are stronger, especially in spring and autumn (5-8 m/s), compared to other directions (3-5 m/s).

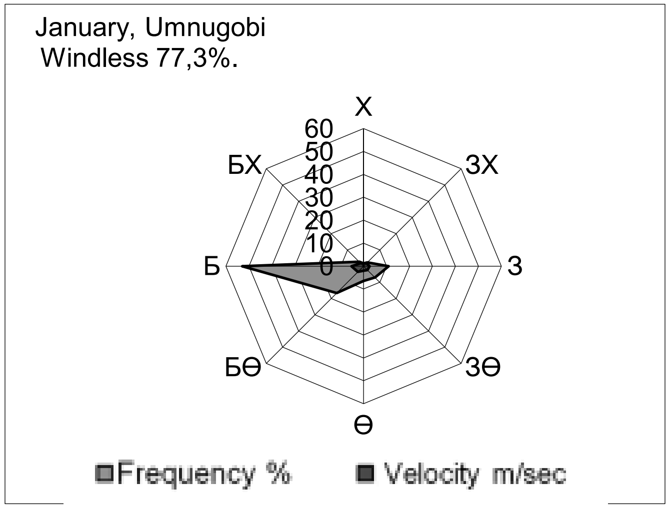
Table 21: Seasonal wind directions, average wind speed (m/s), and frequency of windless periods (%), Umnugovi soum.

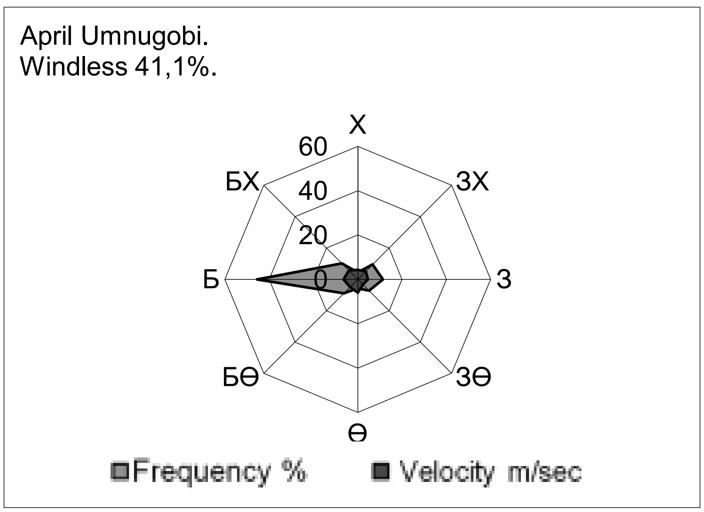
Quarter	Parameter	N	NE	E	SE	S	NW	W	SW	Windless (%)
1	Frequency%	1.2	2.3	10.9	7.0	6.4	16.6	52.9	2.7	77.3
	Speed m/s	2.2	2.5	1.6	1	1	0.7	1	3	
2	Frequency%	3.1	9.5	11.4	7.2	4.1	8.9	45.5	10.2	41.1
	Speed m/s	4.3	5.1	4.6	3.3	6.0	4.9	6.4	5.7	
3	Frequency%	2.7	11.9	17.8	3.7	3.6	7.8	44.9	7.5	55.9
	Speed m/s	3.9	4.9	4.2	5.3	4.6	6.1	8.2	6.8	
4	Frequency%	1.6	3.3	7.2	3.3	5.7	14.8	53.9	10.3	57
	Speed m/s	1.9	3.2	3.0	2.7	2.4	3.9	5.6	4.9	

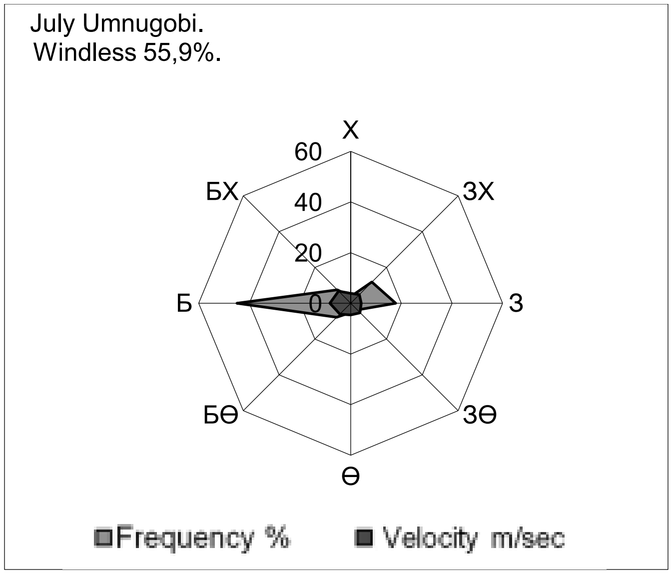
Source: PPTA climate expert, 2017.

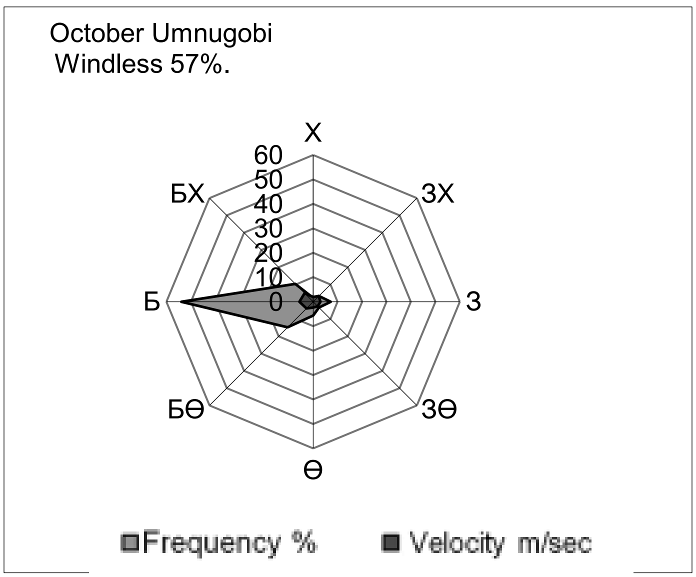
142. The prospective wind farm annual yields were assessed using meso-scale data analysis (80 m height above ground). When converted to power output, the estimated yields and annual capacity factors were estimated (**Figure 41**).

Figure 40: Umnugovi wind roses.



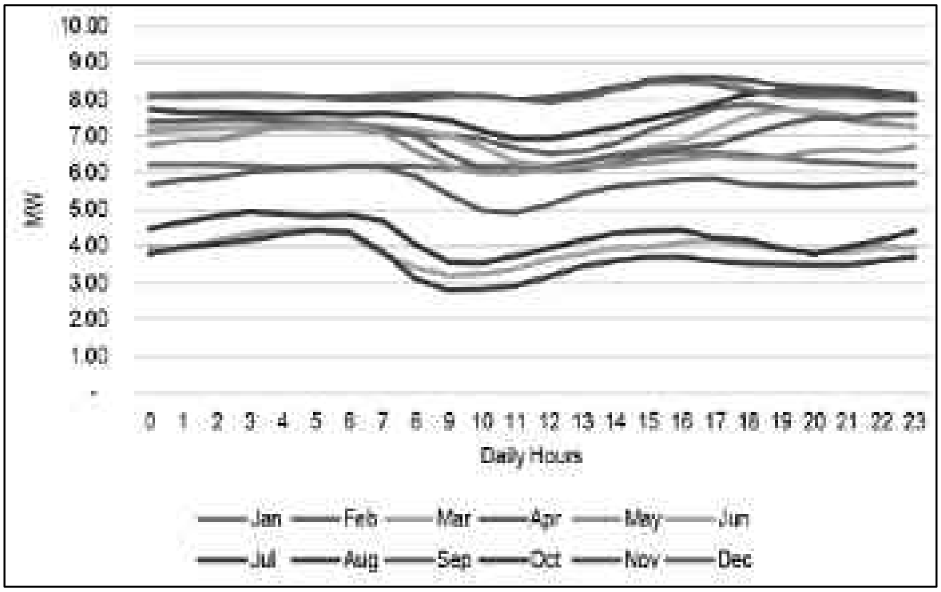






Source: PPTA climate expert, 2017.

Figure 41: Umnugovi Wind Daily Profiles by Season (MW).



Source: PPTA, 2017.

f) Water Resources

143. Water resources in Umnugovi Soum are limited, due in part to low precipitation and high evaporation. According to the national water census, there are 3 rivers, 11 lakes and 39 springs in the soum.

144. The subproject site is located within the Khovd River Basin. There is no surface water on the site; the nearest surface waters are Namir River over 9 km to the north, and Uvsiin Khar Us Lake (also referred to as Khar Us Lake and Ulgii Lake), 11.5 km to the northeast (**Figure 42**). The lake has an area of 73 km^2, an average depth of 7 m.[9] It is fed by the Namir River, which originates from the Kharkhiraa and Turgen mountains to the north and has a watershed area of 2,803 km^2. The lake appears to be endorheic – there is an inflow in the northeast (Namir River) and an intermittent unnamed water channel entering from adjacent mountains in the southeast end, but no visible outflow point. Water in the lake is reported by local authorities to be saline and turbid, and poor habitat for fish and birds. Uvsiin Khar Us Lake should not be confused with the much larger Khar Us Lake, almost 80 km to the south at the two nearest points.

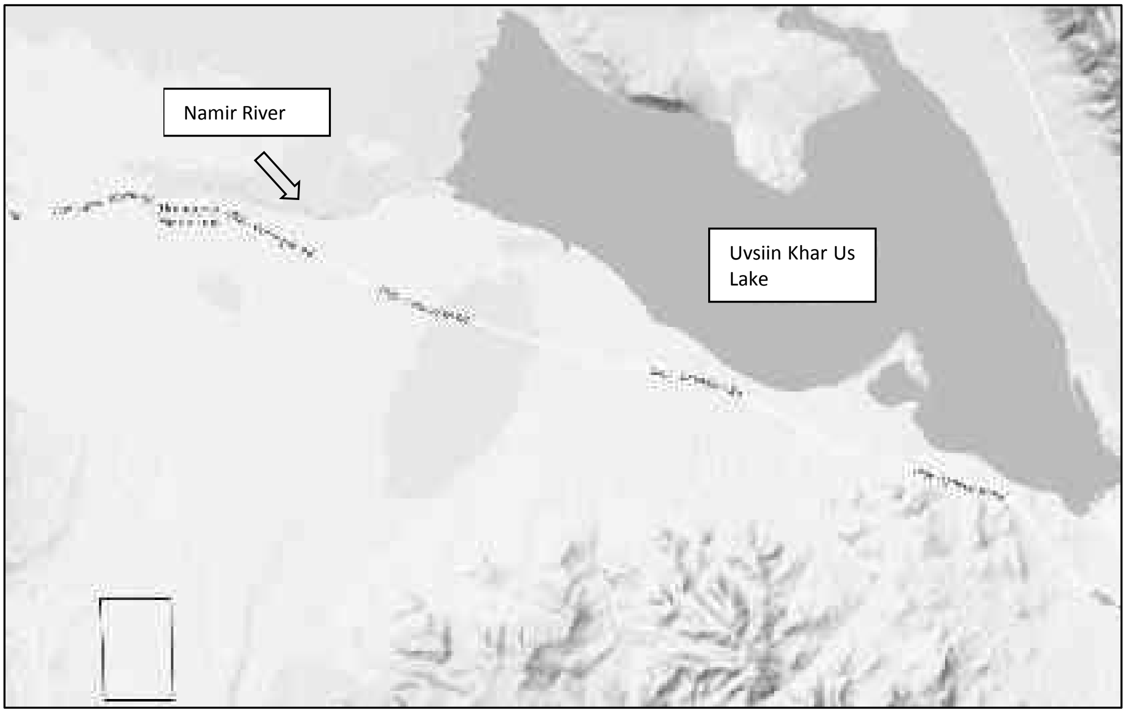
145. The Umnugovi Soum government reports that groundwater resources in the soum are restricted. There is a groundwater well owned by Western Energy System at the Umnugovi substation, 6.6 km from the wind farm site. The well has not been officially registered and its capacity is not available. However, substation personnel report that the well is 45 m deep and has a good supply. This is the closest well to the subproject site.

146. Water quality analyses from exploration and other wells in the general area shows that the water is characterized by high levels of hydrocarbonate, calcium and magnesium cations and

[9] https://www.lakepedia.com/lake/uvsiin-khar-us.html

anions. Mineralization is 0.1 g/l, with 0.18-0.64 mg/l fluoride and 0.5-1.0 mg/l nitrate, and very low or no nitrite and ammonia. There are no wells within 500 m of the wind farm site.

Figure 42: Surface water resources, Umnugovi site area.



Source: Google maps, 2017.

2. Ecological Resources

a) Flora

147. **Table 22** presents a list of plant species found in the general area, including surrounding hills and Uvsiin Khar Us Lake. However, vegetation cover in the subproject area is extremely sparse, and is limited to grasses such as feather grass (*stipa gobica*), which is widespread throughout north Asia, and does not have an IUCN Red List conservation status; couch grass (*Agropyron repens*), which is a very common perennial species of grass native to most of Europe, Asia, the Arctic biome, and northwest Africa and which does not have an IUCN Red List conservation status; and shrubs such as (*Caragana pygmaea*) a widely spread common species that also does not have an IUCN Red List conservation status (**Figure 43**). All species found at the project site are common to the area, and surveys found no rare, endangered or protected species or areas of critical habitat.

Figure 43: Vegetation in the subproject area, including grasses and shrubs such as *Caragana pygmaea*.

Source: PPTA consultant, 2017.

Table 22: Mongolian and Latin names of some plant species found in Umnugovi Soum area.

№	Mongolian names	Latin names
1.	Агь	*Artemisia frigida*
2.	Арзгар согсоот	*Heteropappus hispidus*
3.	Ахар навчитбаглуур	*Anabasisbrevifolia*
4.	Беллардын бушилз	*Kobresia Bellardii*
5.	Шеллийн бутнуур	*Helictorichon Schellianum*
6.	Гяргар дэрс	*Achnathecum splendens*
7.	Говийн хэрээн нүд	*Asparagus trichopyllus*
9	Ленийн ботууль	*FestucaLenensis*
10	Навчгүй баглуур	*Anabasis brevifolia*
11	Нангиад зээргэнэ	*Ephedra sinica*
12	Орог тэсэг	*Eurotia ceratoides*
13	Монгол өвс	*Stipa gobica*
14	Мөлхөө хиаг	*Agropyron repens*
15	Нарийн цахилдаг	*Lris tenuifolia*
16	Нангиад зээргэнэ	*Ephedra sinica*
17	Орог тэсэг	*Eurotia ceratoides*
18	Өдлөг хялгана	*Stipa pennata*
19	Сайрын хялгана	*Stipa glareosa*
20	Бялуу улаан толгой	*Agrostis clavata*
21	Монгол сонгино	*Allium mongolicum*
22.	Тагийн үнэгэн сүүл	*Alopecurus alpinus*
23	Адамсын шаралж	*Atemisia Adamisia*
24	Саман ерхөг	*Agrophyron cristatum*
25	Нангиад хунчир	*Astragalius chinansis*
26.	Сөөгөн боролзой	*Ajania fruticulosa*
27	Таана	*Allium polyrrhozun*
28	Үлд өвс	*Orostachys spinosa*
29	Зүүн гарын хазаар өвс	*Cleistogenes songorica*
30.	Хонин ботууль	*Festuca ovina*
31.	Хэвлиг хувиланги	*Pediculars amoena*
32	Имт гэчгэнэ	*Potentillgbifurca*
33	Ипполитын Зэгс	*SeirpusHippolytii*
34	Үслэг манан хамхаг	*Bgssia dasyphylla*
35.	Цагаавтар гичгэнэ	*Potentilla dealbata*
36	Шивүүрт ортууз	*Oxytropis aciphylla*
37.	Ширэг улалж	*Carex duriuscula*
38	Одой шимэрс	*Hedysarum pumilum*
39	Эгэл Нишингэ	*Phragmitis communis*
40	Элсний шаралж	*Artemisia sp*
41	Олслог халгай	*Urtic cannabina*
42	Сибирь шинэс	*Larix sibirica*
43	Одой хайлас	*Ulmus pumila*
44	Цагаан бургас	*Salix Ledebouriana*
45	Төгрөг навчит хус	*Betula rotundifolia*
46.	Яшилдуу чацаргана	*Hippophae rhamnoides*

Source: Prof. Urtnasan B, 2017, Flora Expert.

b) Fauna

148. The mountains and valleys of Uvs Aimag are home to a range of animals including snow

leopards in Altan Khukhii Mount, mountain sheep and goats, and wolves. However, the project site is close to Umnugovi town and has very spare vegetation cover, and is not suitable habitat for large mammals. Smaller mammals in the project area include Tolai hare (*Lepus tolai*), mountain hare (*Lepus timidus*), long-tailed suslik (*Spermophilus undulates*) and Siberian jerboa (*Allactaga sibirica*).

149. Mountain areas in the region provide habitat of bird species including bearded vulture (*Gypaetus barbatus*), golden eagle (*Aquila chrysaetos*) chukar partridge (*Alectoris chukar*) and Himalayan griffon vulture (*Gyps himalayensis*). These areas are also home to Altai snowcock, snow grouse, black kite, the endangered saker falcon, lesser kestrel, shrike, and boreal owl. As noted above, the subproject area has limited vegetation cover and is poor quality habitat. Although the afore mentioned species may pass through the project area in a transient manner, typical common species in the area include common birds such as the common raven (*Corvus corax* – Least Concern IUCN Red List status), rook (*Corvus frugilegus* – Least Concern IUCN Red List status), jackdaw (*Coloeus monedula* – no IUCN Red List conservation status), Eurasian magpie (*Pica frugilegus* – Least Concern IUCN Red List status), hill dove (*Columba rupestris* – Least Concern IUCN Red List status), and sparrow species (Least Concern IUCN Red List status). There are no known rare or endangered species of fauna within the subproject area.

150. Uvsiin Khar Us Lake, 11.5 km to the northeast of the wind farm, has been designated as an Important Bird Area (IBA) by Birdlife International. However, as noted above, the lake is fed by the Namir River, and is endorheic – there are inflows but no visible outflow. The soum Governor and local officials for the State Environmental Inspectorate report that the Namir River dissolves clays and salts during its flow along the Namir Valley, and this combined with its endorheic state has resulted in the lake being saline and turbid. The State Environmental Inspectorate reports that there are no fish in the lake, and it is poor in mollusks and other key food sources for water birds. As a result, the lake is not a transit area for migratory birds or a significant habitat area for resident birds. In 27 years of monitoring reports prepared by the local State Environmental Inspectorate, there have been no reports of resident or migratory birds at Uvsiin Khar Us Lake (**Appendix VII**).

c) Protected Areas

151. There are no parks, protected areas, nature reserves within or adjacent to the subproject site. This was confirmed through discussions with soum officials, a review of relevant Mongolian documentation, and a review of the IUCN World Database on Protected Areas. The closest protected areas to the site are the Bassin d'Ubs Nuur World Heritage Site, 45 km to the northwest of the site; Khan Khukhii-Khyragas Lake National Park, 73 km to the east; and the Altan Khukhii Nature Reserve, 15 km to the southwest (**Figure 44**).

152. As noted above, Uvsiin Khar Us Lake has been designated as an IBA by Birdlife International. However, it does not have any official protection status.

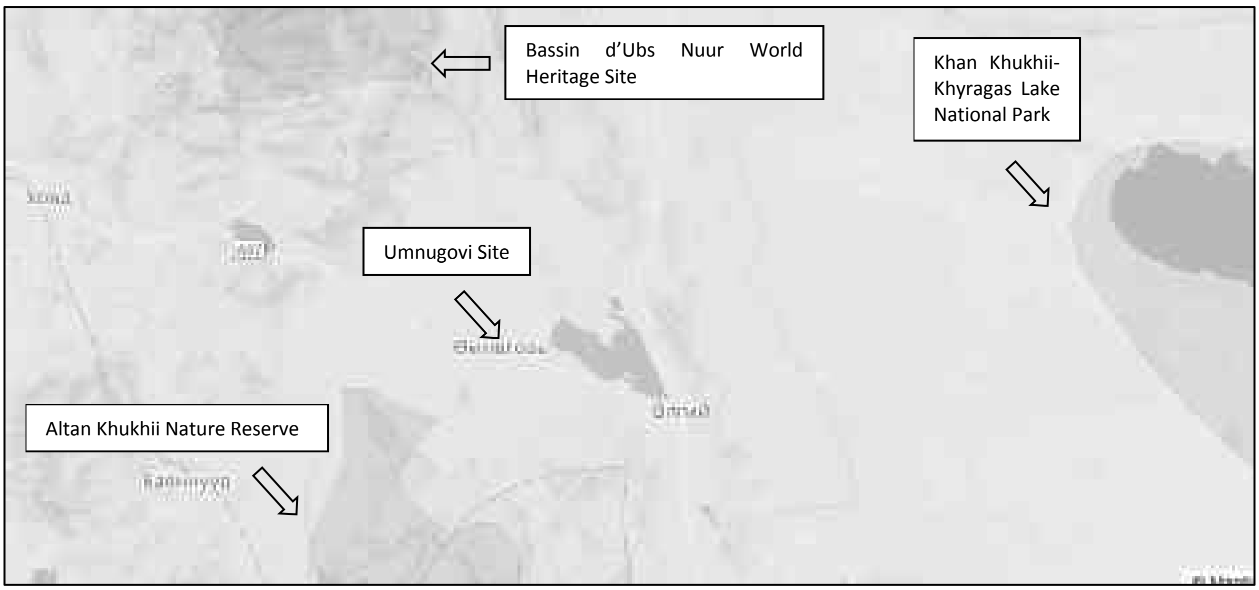
3. Socioeconomic Profile

153. Umnugovi Soum has a population of approximately 4,200 (**Table 23**), while the soum center (Umnugovi town) has approximately 2,000 residents though it experiences seasonal fluctuations. The soum population has shown a decrease over the 2000-2014 period. The soum is divided into 5 bahg, Kholboo, Uliast, Orlogo, Bayabngol and Namir. The subproject is located in Namir Bahg.

154. Traditional livestock husbandry is one of the key economic sectors in the soum, including sheep, goat, cattle, camel and horse. Related activities include the sale of sheep and camel wool, cashmere, hides, fermented mare milk, and dairy and meat products. Crop farming has become more significant in recent years, including potatoes and other vegetables. In terms of mining, Yavar coalfield is 12 km and Orlogo gold deposit 30 km from the soum center.

155. The soum center has three schools: two elementary (year 5 and under) one is private the other state run with 250 students between them; and one grades 5-12 school with approximately 1000 students. A total of approximately 1250 students attend school in the soum center. In addition, there is a kindergarten with approximately 250 students.

Figure 44: Closest protected areas to the Umnugovi site.



Source: World Database on Protected Areas, IUCN, 2017.

156. According to Soum Environment and Land officers, there are no known physical cultural resources (PCRs) at the site. The Umnugovi Soum Governor reports that closest officially recognized PCR is Tsagaan bulan (rock paintings) located approximately 20 km from the project site.[10]

[10] Draft: Environmental Assessment Report P152343: MONGOLIA - SECOND ENERGY SECTOR PROJECT COMPONENT 2 (SOLAR) NOVEMBER 2016.

Table 23: Population of Umnugovi soum (2000-2014).

Year	Permanent Residents	Women	Men
2000	4723	2419	2304
2001	4734	2424	2310
2002	4497	2271	2226
2003	4335	2179	2156
2004	4444	2262	2182
2005	4526	2286	2240
2006	4469	2278	2191
2007	4503	2278	2225
2008	4336	2187	2149
2009	4222	2152	2070
2010	4177	2119	2058
2011	4170	2110	2060
2012	4320	2173	2147
2013	4348	2204	2144
2014	4192	2097	2095

Source: Statistics Yearbook of Uvs Aimag, 2015.

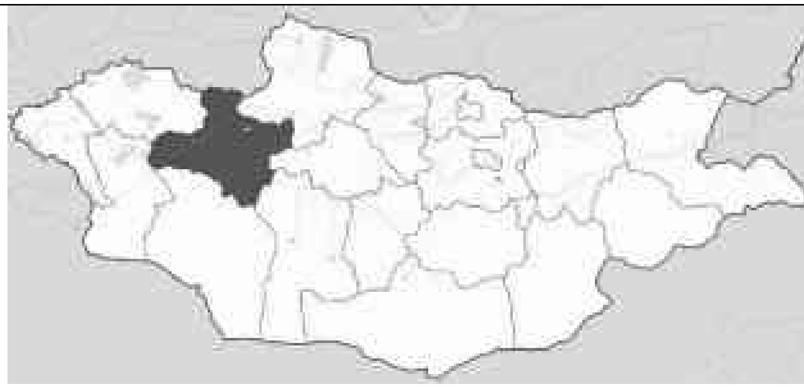
D. Uliastai

1. Physical Resources

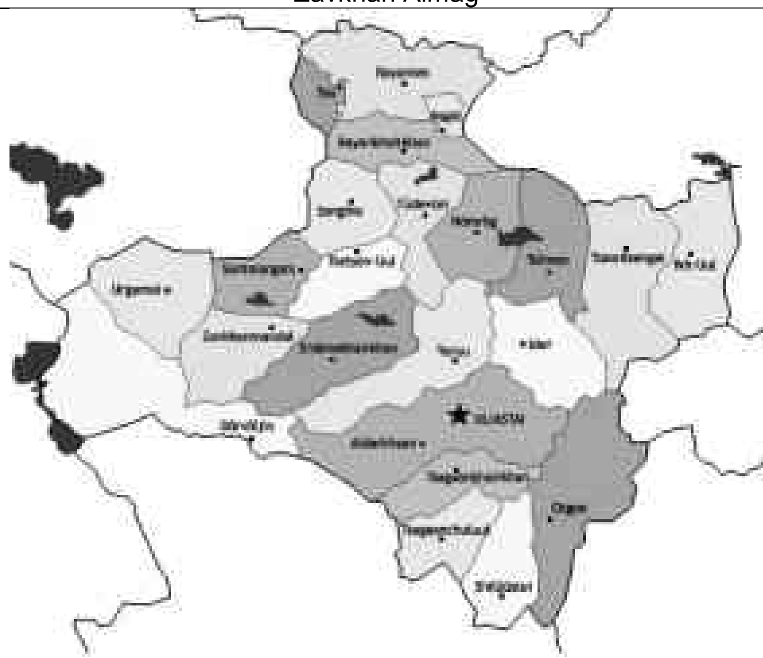
a) Geography and Topography

157. Uliastai City (previously known as Javkhlant), is the capital of Zavkhan Aimag and is located in the south-central portion of the aimag (**Figure 45**). The aimag is named after the Zavkhan River, which forms the border between Zavkhan and Gobi-Altai aimags. Uliastai City is located in a valley where the Chigestai and Bogdiin Gol rivers meet to form the Zahvkhan River, and is surrounded by mountains on all sides. It is one of the most remote aimag capitals in Mongolia.

Figure 45: Location of Zavkhan Aimag and Uliastai City.



Zavkhan Aimag

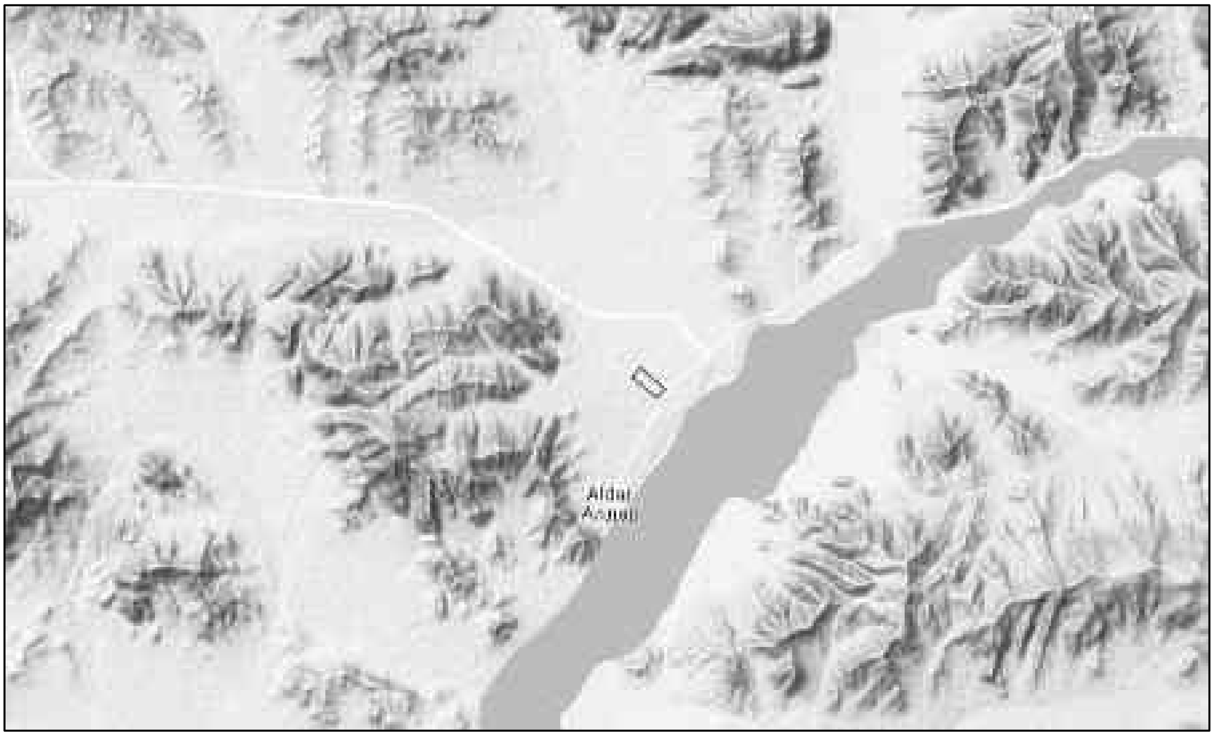


Uliastai City (Yesonbulag Soum)

Source: Wikipedia, 2018.

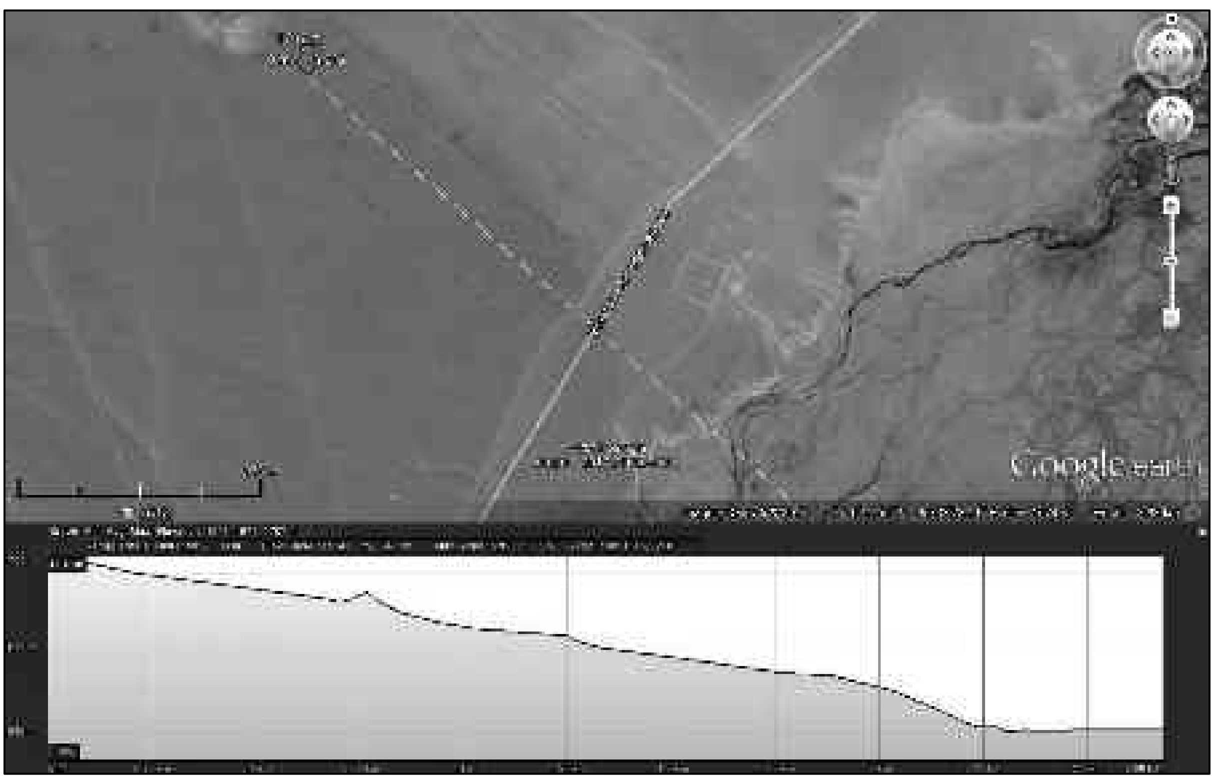
158. The PV farm will be located 22.6 km southwest of the city proper (34 km by paved road), south of the Donoi Airfield (**Figure 7**). The site is situated on a flat north-south oriented valley plain 5 km wide, northwest of the Chigestei River, and surrounded by mountains (**Figure 46**). The site is flat, sloping slightly toward the Chigestei River (**Figure 47**).

Figure 46: Uliastai Solar PV site regional topography.



Source: Google Maps, 2017.

Figure 47: Uliastai Solar PV site topographical profile.



Source: Google Earth, 2017.

b) Land Use

159. The land at the site is not currently used or occupied. Site visits by the PPTA consultants and interviews on land acquisition and resettlement with local authorities confirmed that the Aimag authority has permission to develop the site. There are no residences or other structures in the subproject area (**Figure 50**).

Figure 48: Uliastai Solar PV site.

Source: PPTA team, 2017.

c) Soils

160. The site is dominated by dry steppe carbonate dark brown soils, with alluvial soils in the adjacent the floodplain of the river.

d) Earthquake Risks

161. According to the Mongolia earthquake risk Modified Mercalli scale map produced by UN OCHA, the site is a Degree VII zone (**Figure 38**). The map indicates that the site is not in the high risk areas of Western Mongolia.

162. According to the World Bank GFDRR hazard screening tool ThinkHazard, the site is in a medium earthquake hazard risk zone, meaning that the potential impacts of earthquakes should be considered during design and construction.

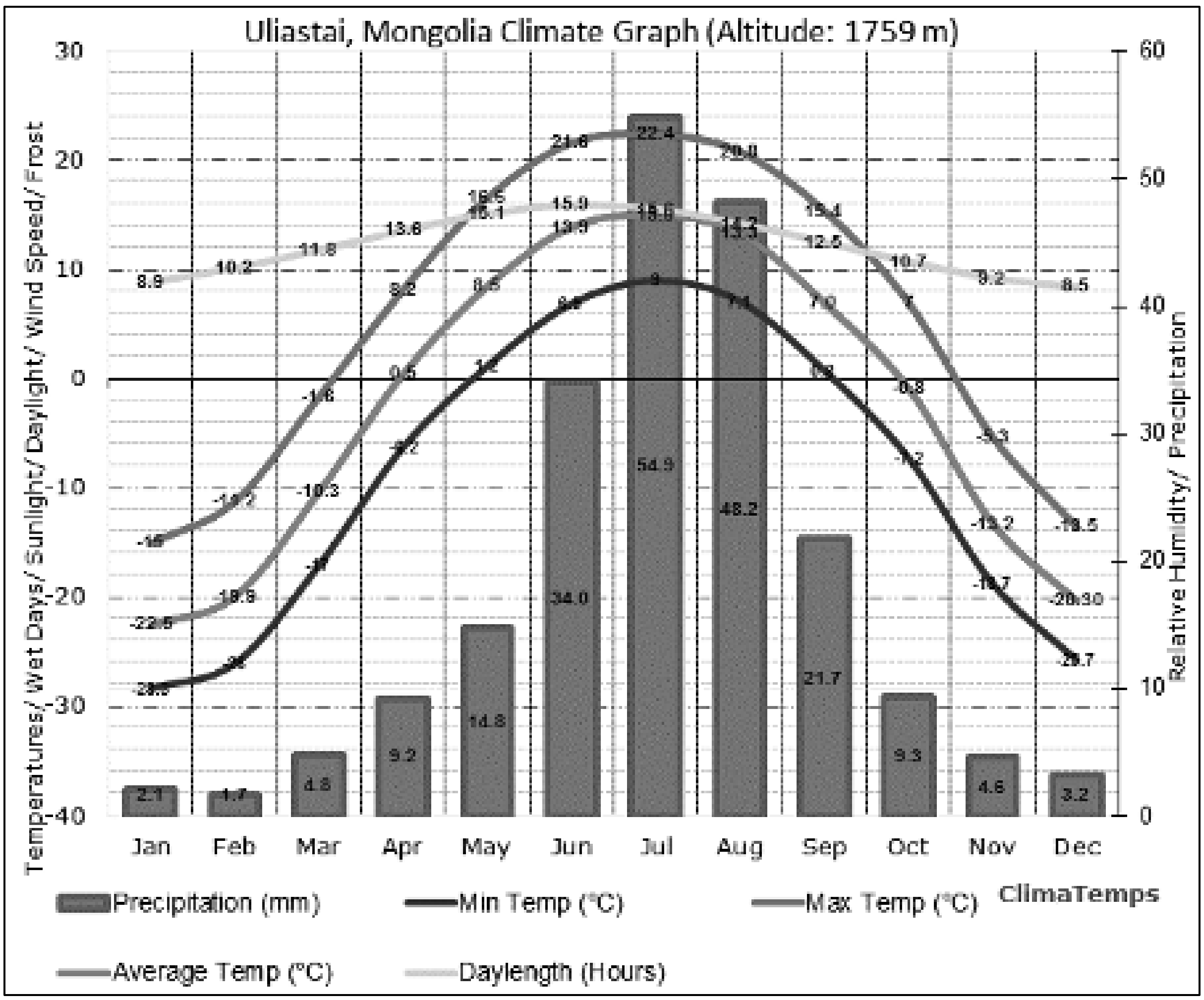
e) Climate

163. Uliastai City has a northern continental climate characterized by long cold winters and short moist summers (**Figure 49**). The average annual temperature is -2.4°C. The coldest month is January with an average temperature of -23°C and an average minimum temperature of -28°C. The hottest month is July with an average temperature of 14°C and an average maximum

temperature of 22°C. Minimum monthly average soil temperatures range from -15 to -25°C in January, and the maximum monthly average soil temperatures range from 18°C to 22°C in July.

164. Average annual relative humidity is 60% and average annual precipitation is 209 mm, the majority of which falls in the summer months. The driest weather is in February when an average of 1.7 mm of rainfall occurs. The wettest weather is in July with an average of 54.9 mm of rainfall. Snow cover usually lasts 120 days.

Figure 49: Uliastai City climatogram.



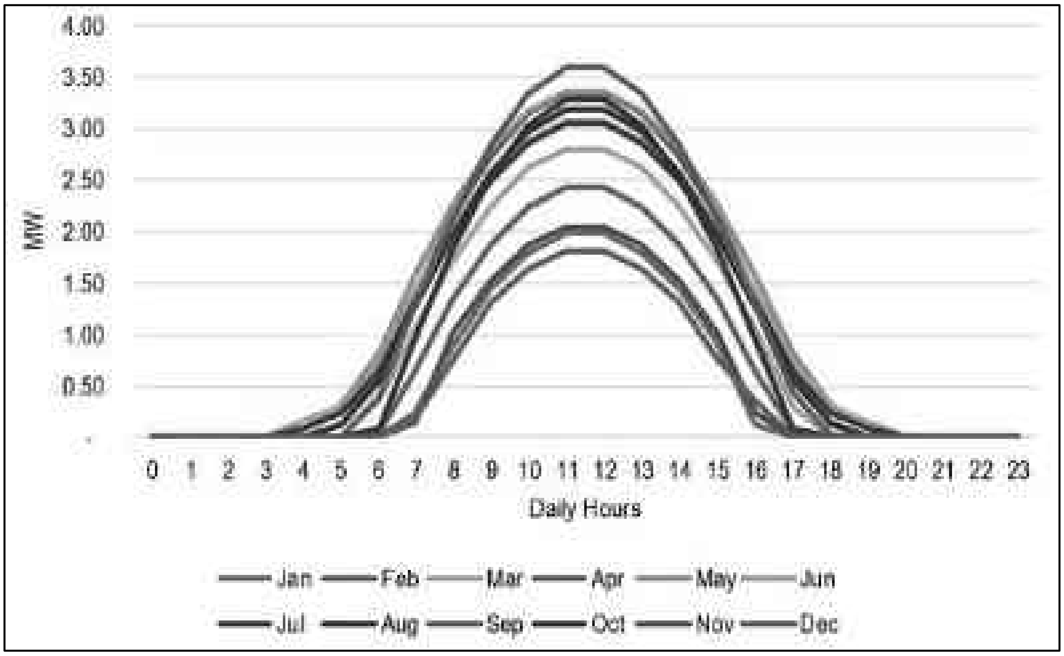
Source: ClimaTemps.com, 2018.

165. The site area receives an average of 2,942.2 hours of sunlight per year. The maximum monthly average hours of sunshine occurs in May (311 hours) and the minimum occurs in December (166 hours). The average annual solar insolation is 1300 kWh/m^2.

166. The potential solar PV farm annual yields were assessed based on insolation data obtained from the PVGIS-SARAH online database, which provides insolation data averaged over 20 years. When converted to power output, the estimated yields are presented in **Figure 50**.

167. The predominant winds directions are from the east and northeast (**Table 24**). Annual mean wind speed is 1.3 m/s.

Figure 50: Uliastai Solar PV Daily Profiles by Season (MW).



Source: PPTA, 2017.

Table 24: Seasonal wind directions, frequency (%), and average wind speed (m/s), Uliastai City.

Quarter	N		NE		E		SE		S		NW		W		SW	
	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s	Freq. %	m/s
I	4.8	1.1	4.0	1.2	1.2	0.4	0.8	0.1	0.8	0.6	2.0	0.9	71.0	6.2	15.3	3.8
II	4.9	4.6	5.2	3.4	1.4	2.8	1.4	1.7	1.4	2.4	9.0	5.6	63.8	6.2	11.9	6.0
III	4.4	3.2	11.4	3.3	8.2	3.8	6.6	5.7	5.0	3.4	9.4	3.6	47.0	4.7	8.0	4.1
IV	3.8	2.6	5.8	2.8	3.5	2.8	1.9	1.4	2.4	2.3	10.1	4.3	65.5	5.0	6.9	4.2

Source: Uliastai BES, prepared by Sunny Trade Co. Ltd LLC, Ulaanbaatar, 2018.

f) Water Resources

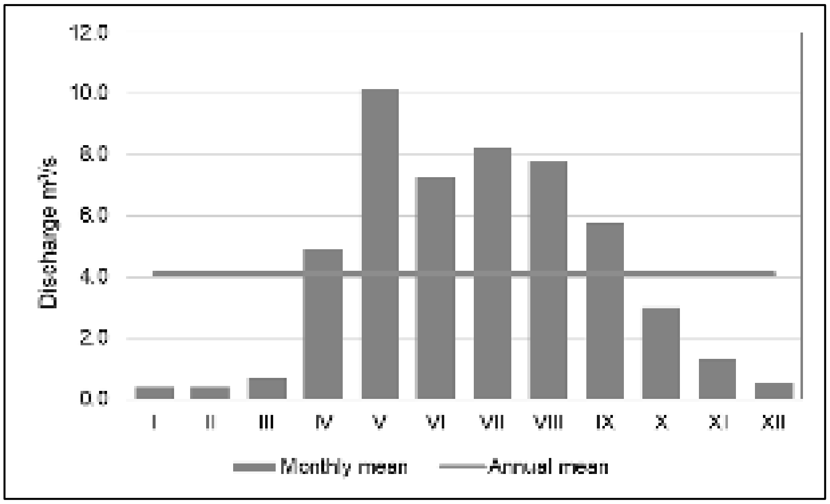
168. There are no surface water resources on the subproject site. The nearest surface water is the Chigestei River approximately 1 km to the southeast. The river flows from Khangai Mountains to Lake Khyargas. Based on data from 1952 to 2014, the annual mean discharge is 4.2 m^3/s. Approximately 65 to 75 % of annual runoff occurs during the warm period from June to October. In January and February, the river is covered by ice.

169. The river has two high flow periods resulting from spring snow and ice melting and summer rainfall. The spring high flow is the larger of the two, and accounts for 25 to 30 percent of annual runoff (**Figure 51**). Annual mean discharge has decreased by 64 per cent or by 4 m^3/s since 1952 (**Figure 52**), and annual maximum discharge has decreased by 72 per cent or by 80 m^3/s (**Figure 53**).

170. Local officials indicate that flood risk is low, and river flooding at the subproject site or the substation (which is closer to the river than the solar site) has not been reported.

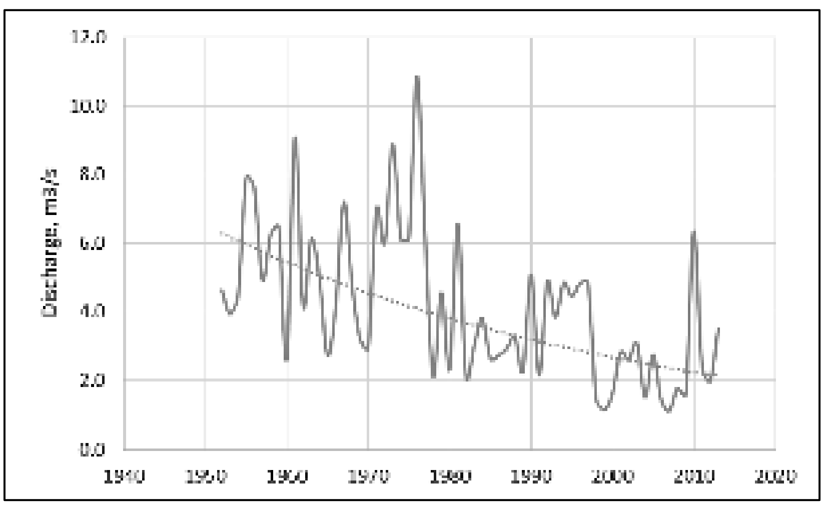
171. There are no wells within 500 m of the subproject site.

Figure 51: Monthly and annual mean discharge, Chigestei River.



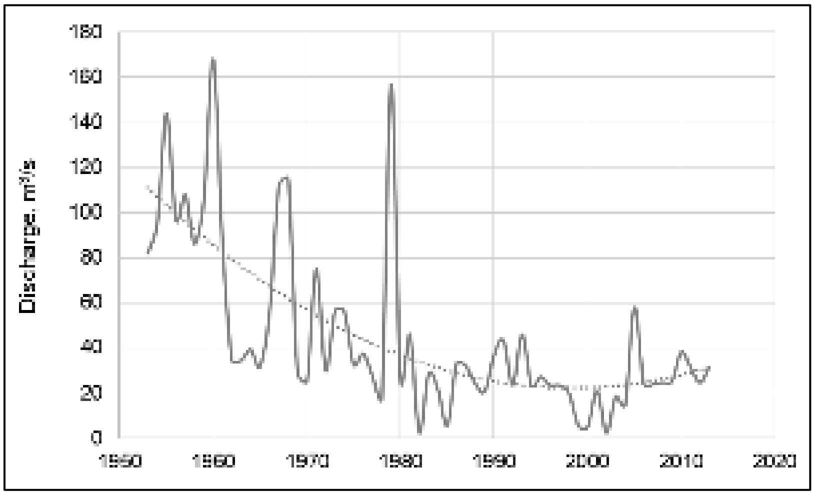
Source: NAMEM, 2017.

Figure 52: Trend of annual mean discharge, Chigestei River.



Source: NAMEM 2017.

Figure 53: Trend of annual maximum discharge, Chigestei River.

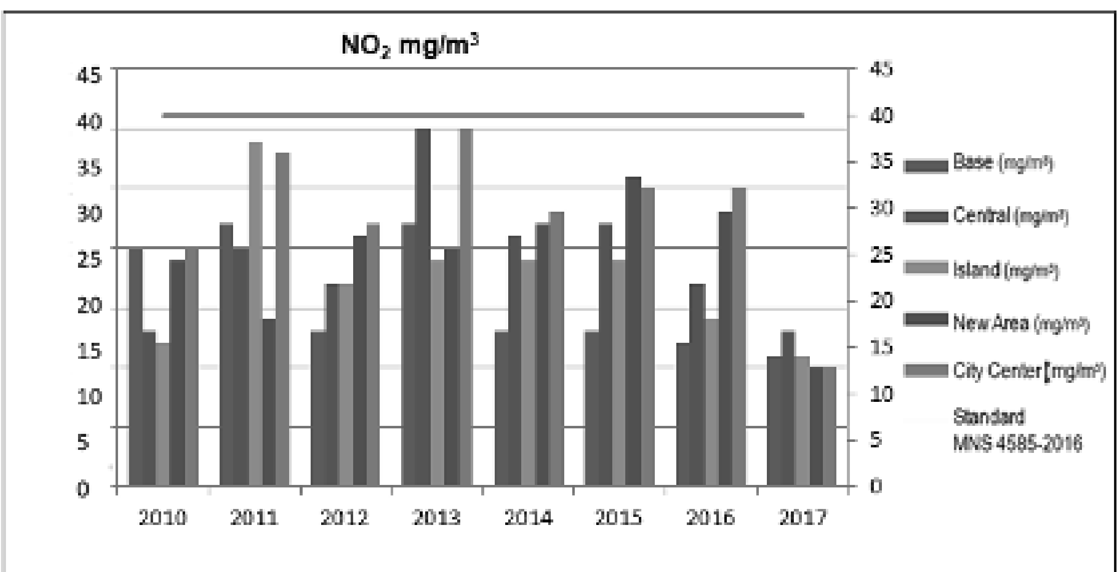


Source: NAMEM 20017.

g) Air Quality

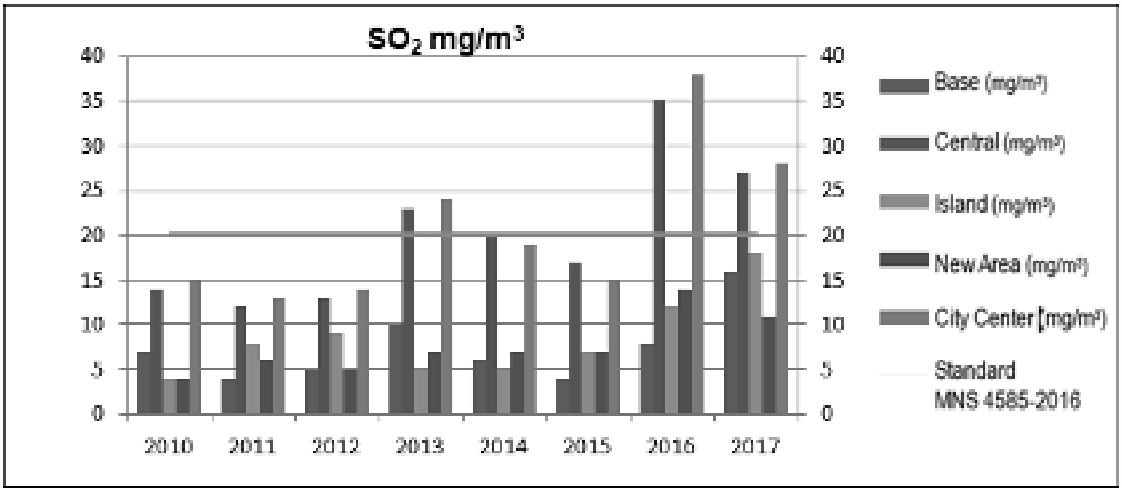
172. The results of air quality monitoring undertaken from 2010 to 2017 in five locations in Uliastai are presented in **Table 25** to **Table 27**. Annual average nitrogen dioxide (NO_2) levels are in compliance with the relevant standards, though monthly averages in the winter often exceed the standard. Annual average sulfur dioxide (SO_2) levels have exceeded the standard in recent years, and again monthly averages in the winter often exceed the standard. PM_{10} standards have been exceeded over the monitoring period, with the situation improving somewhat since a peak in 2012.

Table 25: Long term average annual 24 hour nitrogen dioxide monitoring results for 2010-2017 period, Uliastai City.



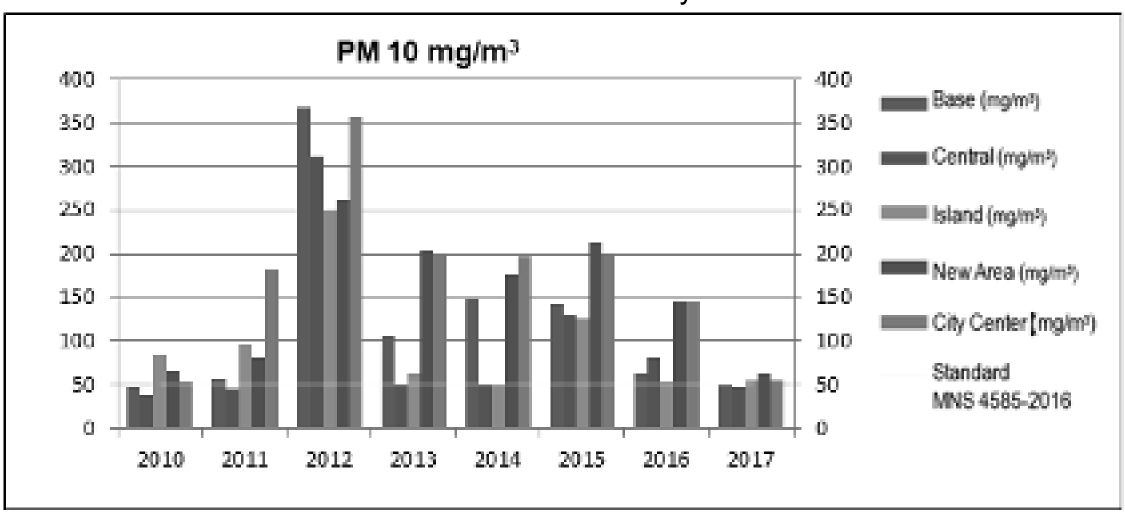
Source: 2017 Environmental Analysis of Zavkhan Aimag.

Table 26: Long term average annual 24 hour sulphur dioxide monitoring results for 2010-2017 period, Uliastai City.



Source: 2017 Environmental Analysis of Zavkhan Aimag.

Table 27: Long term average annual 24 hour PM10 monitoring results for 2010-2017 period, Uliastai City.



Source: 2017 Environmental Analysis of Zavkhan Aimag.

173. The results indicate that Uliastai experiences considerable urban air pollution, likely as a result of automobile traffic, industrial emissions, and domestic heating and cooking with coal. No monitoring results are available at the project site, but given its distance from the city air quality is likely to be significantly better.

2. Ecological Resources

a) Flora

174. The subproject site is on the outskirts of an urban area near an airfield. Site vegetation is sparse and consists of low grasses such as *Agrostis mongolica* (no IUCN Red List conservation status); plants such as peony (*Potentilla Gelida,* no IUCN Red List conservation status), *Veronica pinnata* (no IUCN Red List conservation status), *Oxytropis Oxyphylla* (no IUCN Red List conservation status), and *Carex Orostachys* (no IUCN Red List conservation status); and weeds such as *Convolvulus ammanii* (no IUCN Red List conservation status). All species found at the project site are common to the area, and surveys found no rare, endangered or protected species or areas of critical habitat.

b) Fauna

175. There are no large mammals utilizing the site. Animals that may be found on or near the site are typical for the urban periphery of Uliastai City, including the common raven (*Corvus corax* – Least Concern IUCN Red List status), house sparrow (*Passer domesticus,* Least Concern IUCN Red List status), and common unthreatened hares, marmots, mice and moles.

c) Protected Areas

176. There are no parks, protected areas, or nature reserves within 50 km of the subproject site. This was confirmed through discussions with soum officials, a review of relevant Mongolian documentation, and a review of the IUCN World Database on Protected Areas.

3. Socioeconomic Profile

177. Uliastai City is the capital of Zavkhan Aimag. Uliastai city has soum status and forms an enclave within the surrounding Aldarkhaan soum. Zavkhan Aimag has a population 70,500. Uliastai City has a population of 15,500, giving it the highest population density of the 24 soums in Zavkhan Aimag.

178. Uliastai City is one of the oldest settlements in Mongolia, and has long been an important center of caravan trade even into the 20th century. It was connected by camel caravan routes with Urga (now Ulaanbaatar) in the east, Khovd in the west, Barkol and other points in Xinjiang in the southwest, and Hohhot in the southeast.

179. The subproject will be located near Donoi Airfield, in Mandaat Bag, Aldarkhaan Soum.

180. Economic sectors in Uliastai City include agriculture, small and medium enterprises and services, but the economy is dominated by traditional livestock husbandry. As of 2016, the total number of livestock in Uliastai was 126,375 including 4,005 horses, 6,094 cattle, 54,163 sheep, 62,075 goats and 38 camels. There are 420 herder households.

181. Uliastai City is connected to Ulaanbaatar by a 1,121 km long paved road. The old Uliastai Airport had two unpaved runways and is close to the city, but no longer receives flights. In 2002, the Donoi Airfield (or "New Uliastai Airfield") was built 25 km west of the city near Aldarkhaan soum, and now periodically serves Uliastai with flights to and from Ulaanbaatar, though it is reportedly out of service for considerable time periods. There are 2 domestic wastewater treatment plants in Uliastai City.

182. There are no known physical cultural resources at the site.

E. Govi Altai

1. Physical Resources

a) Geography and Topography

183. Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag, is located in the north central portion of the aimag (**Figure 54**).

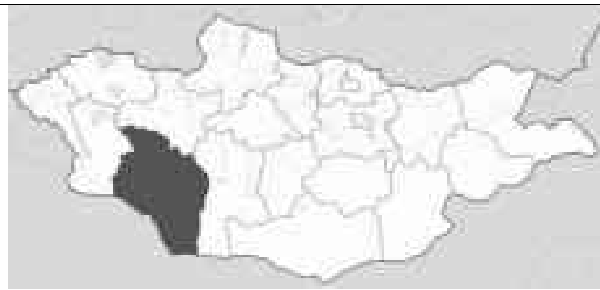
184. The PV farm will be located on a 20 ha site along the paved road from Khovd, north of the Altai Airport, and 1.5 km from the edge of Altai City, in Jargalant Bahg (**Figure 16**).

185. Altai City is located on a plateau of Altai's Khantaishir Mountain at an elevation of 2181 masl (**Figure 55**). The PV farm site is very flat, with only a few meters elevation change over its length (**Figure 56**).

b) Land Use

186. The land at the site is not currently used or occupied. Site visits by the PPTA consultants and interviews on land acquisition and resettlement with local authorities confirmed that the Aimag authority has permission to develop the site. There are no residences or other structures in the subproject area.

Figure 54: Location of Govi Altai Aimag and Altai City (Yesonbulag Soum).



Govi Altai Aimag

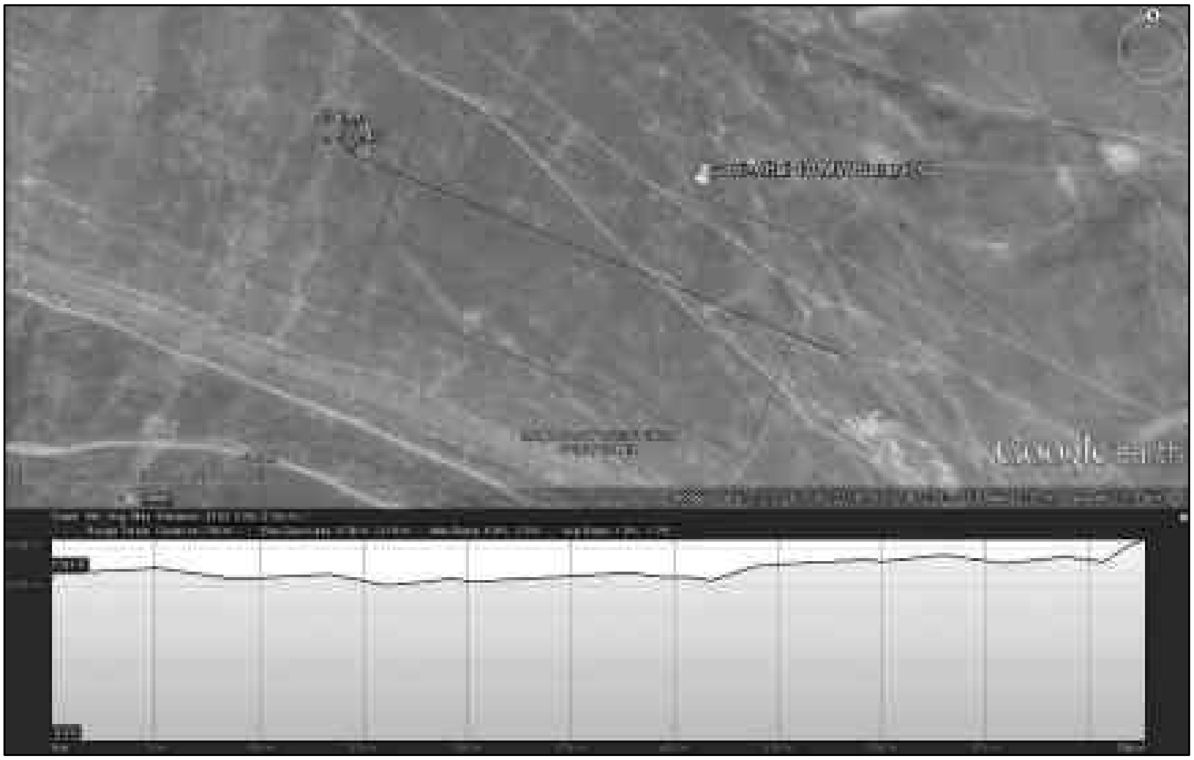
Altai City (Yesonbulag Soum)

Source: Wikipedia, 2017.

Figure 55: Topography of Altai City.

Source: Google Maps, 2017.

Figure 56: Govi Altai Solar PV site topographical profile.



Source: Google Earth, 2017.

c) Soils

187. Site soils are typical of the area, infertile pale brown sandy loams, and have been degraded by erosion and agricultural activities. As part of the DEIA investigations soil sections were dug to assess site soil properties, and samples were taken for laboratory analysis at the Soil Laboratory, Institute of Geography and Geoecology, Academy of Sciences.

188. Soil section 17-01 is representative of the site:

0 cm	Surface is covered with 40 to 50% rocks.
0 to 15 cm	Color is faded brown (sand in 0-1.5 cm), few plant roots, small pebbles and stones account for 20%, fragile texture with sandy and loose silt, slightly pulverescent with chloric acid, transition is notable.
15 to 35 cm	Dense, very few plant roots, sand and pebble stones account for 40%, carbonate is penetrated in the soil with faded spots of accumulation, pulverescent with chloric acid.
30-50 cm	Fair, dense, sandy, fragments and pebble stones are 50%.

189. The humus content is low in the upper layers at 1.410% and is just 0.206% in lower horizons. The soils are carbonated, with $CaC0_3$ ranging from 2.18 to 3.64%. pH ranges from 7.62 to 7.74. The soils have high sand levels, and are easily eroded.

Table 28: Chemical and physical properties of soils at Section 17-01, Govi Altai site.

Sampling depth, cm	**Humus, %**	**$CaCO_3$ %**	**pH**	**EC $_{2,5}$ ds/m**	**Dynamic element per 100 g soil, mg**		**Mechanical particles,% (size of particles, in mm)**		
					P_2O_5	K_20	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
Site description: Section 17-01, infertile pale brown sandy loams covered by rocks									
0 - 15	1.410	2.18	7.62	0.174	1.60	13.5	73.3	14.6	12.1
15 - 30	0.206	3.64	7.74	0.150	0.39	5.8	71.1	18.3	10.6

Source: Institute of Geography and Geoecology, 2017.

190. The site shows signs of domestic waste disposal. A combined soil sample was taken from 0-10 cm in the western part of the site to assess the degree of pollution. According to the result of heavy metal analysis, the site shows signs of heavy metal contamination likely as a result of waste disposal, but the concentrations do not exceed the maximum permissible soil standards (**Table 29**). Before any excavation is undertaken, a more thorough soil sampling analysis will be conducted to confirm no contamination. If there are physical signs of waste disposal, the waste will be removed to suitably licensed landfill prior any works commencing on site.

d) Earthquake Risks

191. According to the Mongolia earthquake risk Modified Mercalli scale map produced by UN OCHA, the site is a Degree VI zone (**Figure 38**). The map indicates that the site is not in the high risk areas of Western Mongolia.

192. According to the World Bank GFDRR hazard screening tool ThinkHazard, the site is in a medium earthquake hazard risk zone, meaning that the potential impacts of earthquakes should be considered during design and construction.

Figure 57: Soil section 17-01, Govi Altai site.

Source: PPTA soil expert, 2017.

Table 29: Concentration of heavy metals in the site soil.

Item	Sampling depth, cm	Concentration of heavy elements, mg/kg				
		Cr	Pb	Cd	Ni	Zn
Sample №-03. N 46°20''44'2 E 96°15''29'3 h-2207	0 – 10	78.9	26.9	0.31	111.0	192.5
Maximum permissible level, MNS 5850: 2008	-	150	100	3	150	300

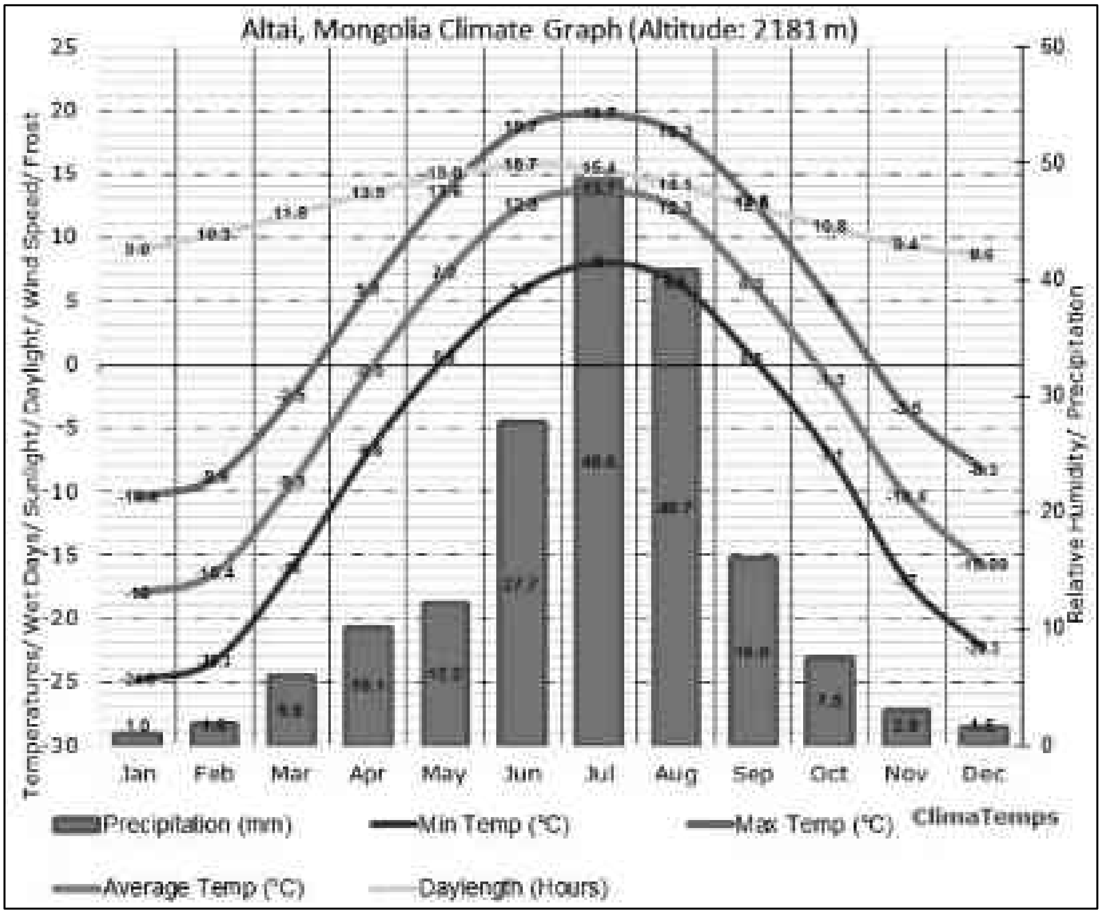
Source: Institute of Geography & Geoecology, 2017.

e) Climate

193. Altai City has a northern continental climate characterized by long cold winters and short moist summers (**Figure 39**). The average annual temperature is -1.4°C. The coldest month is January with an average low temperature of -18.1°C and a lowest recorded temperature of -40.8°C. The hottest month is July with an average temperature of 14.3°C and a maximum recorded high of 31.1°C.

194. Average annual relative humidity is 68% and average annual precipitation is 181 mm. Approximately 66% of average annual precipitation (119 mm) falls in summer months, and there is little precipitation in the winter. The site area receives an average of 3,260 hours of sunlight per year. The maximum monthly average hours of sunshine occurs in June (352 hours) and the minimum occurs in December (178 hours). Average daily sun shine ranges from 5 – 6 hours in December and 9 – 9.8 hours in May through June (**Figure 59**).

Figure 58: Altai City climatogram.



Source: ClimaTemps.com, 2017.

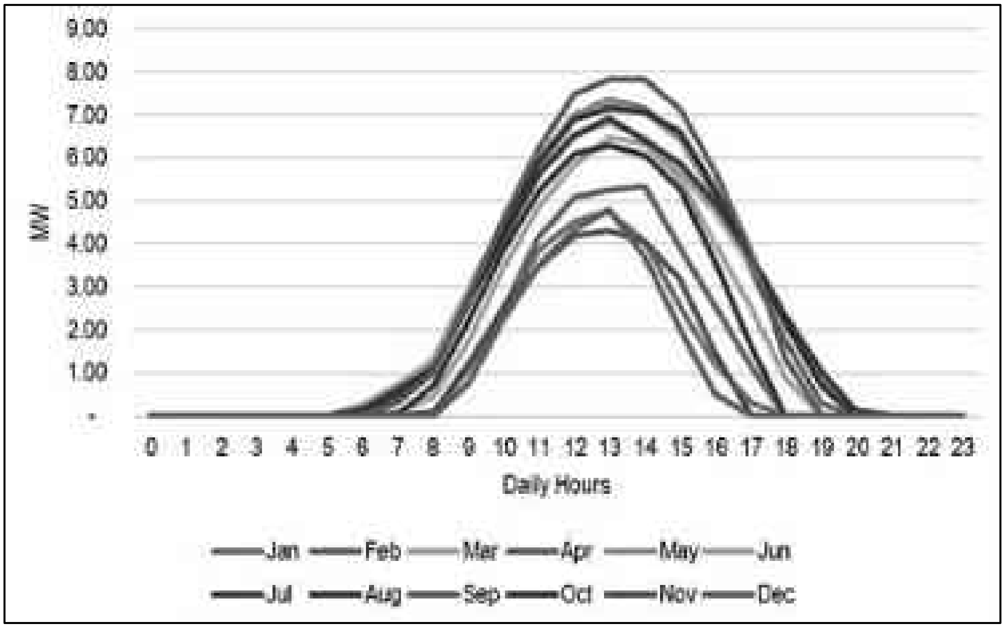
Figure 59: Monthly and annual average Altai City solar radiation data.

Indicators	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Annual**
Sunshine, hours	204	215	273	295	333	342	352	331	286	251	200	178	3260
Direct solar radiation, kW/m²	93	178	252	281	343	327	356	350	281	180	102	84	2827
Total solar/m²	199	273	448	545	617	609	586	533	434	328	212	154	4939
Dispersed solar radiation kW/m²	71	102	177	218	252	243	227	189	145	120	84	66	1893
Direct solar radiation to vertical surface, kW/m²	416	425	510	514	554	549	524	550	542	468	395	334	5776
Direct solar radiation to lateral surface, kW/m²	129	172	270	327	364	366	359	344	289	209	129	89	3046
Solar radiation balance, kW/m²	-30	13	86	191	260	281	265	242	153	58	-17	-38	1463

Source: PPTA climate expert, 2017.

195. The potential solar PV farm annual yields were assessed based on insolation data obtained from the PVGIS-SARAH online database, which provides insolation data averaged over 20 years. When converted to power output, the estimated yields are presented in **Figure 60**.

Figure 60: Govi-Altai solar PV daily profiles by season (MW).



Source: PPTA, 2017.

196. The predominant winds directions are from the west and northwest (**Table 30**). Annual mean wind speed, which is not dependent on wind directions, is 3.4 m/s.

Table 30: Seasonal wind directions, average wind speed (m/s), and frequency of windless periods (%), Altai City.

Quarter	Parameter	N	NE	E	SE	S	NW	W	SW	Windless (%)
1	Frequency%	3.1	1.7	1.1	1.4	3.4	12.2	56.2	13.6	42
	Speed m/s	3.0	2.6	1.9	2.3	3.1	5.4	5.7	4.7	
2	Frequency%	7.7	3.5	1.8	1.6	3.8	22.1	48.8	10.6	21.4
	Speed m/s	6.2	4.9	3.0	3.1	4.2	7.5	7.8	7.0	
3	Frequency%	7.8	6.1	2.9	3.0	4.4	19.4	46.5	10.0	29.2
	Speed m/s	5.2	4.1	3.0	3.3	4.3	5.6	6.2	5.1	
4	Frequency%	2.7	2.0	1.5	1.8	4.5	27.0	52.2	8.5	27.5
	Speed m/s	3.6	2.8	2.2	2.4	3.7	6.5	6.6	5.3	

Source: PPTA climate expert, 2017.

f) Water Resources

197. There are no surface water resources on or adjacent to the subproject site. The nearest surface water body is more than 3 km to the east (Figure 61).

198. Yesonbulag's water supply system includes 31 pumped wells of which 9 are deep, and 37

hand wells. The water is hard but no necessarily above Mongolian standards, though there is a slight exceedance of magnesium (**Table 31**). There no wells within 500 m of the subproject site.

Figure 61: Surface water resources, Govi-Altai site area.

Source: Google maps, 2017.

Table 31: Yesonbulag water hardness.

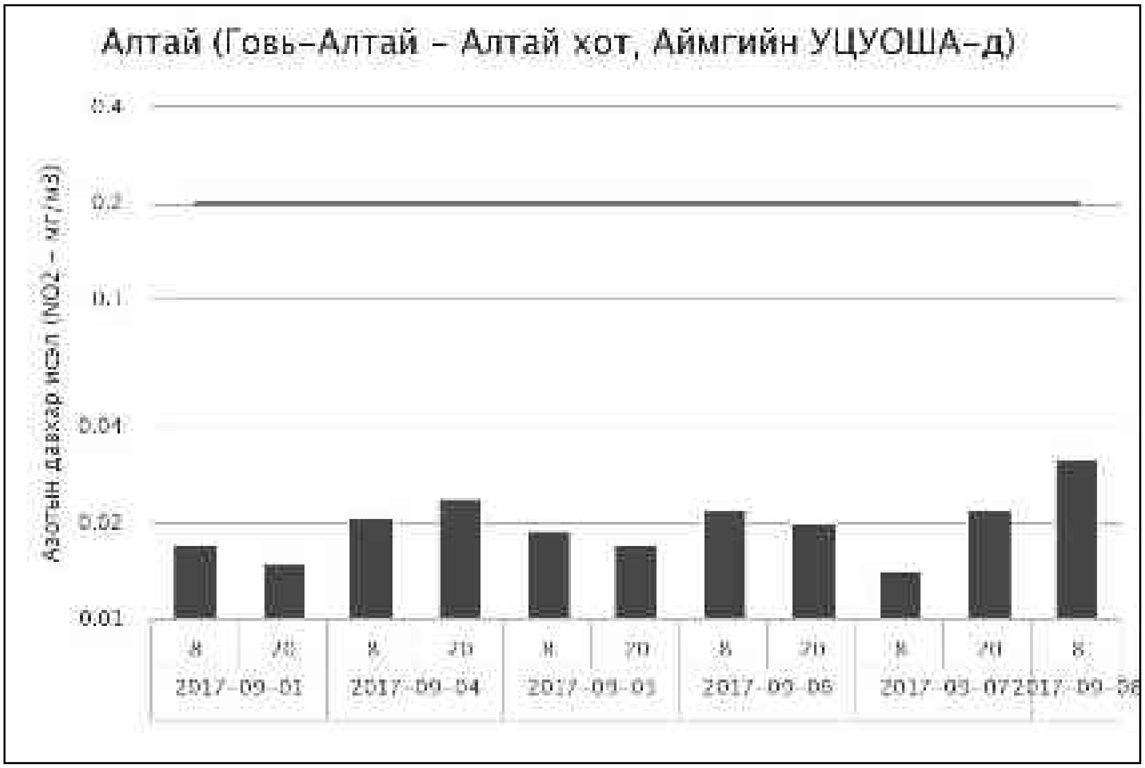
Standard	Hardness	Calcium	Magnesium
Result	199 mg $CaCO_3$ mg/l	28 mg/l	31 mg/l
Mongolian standard	350 mg $CaCO_3$ mg/l	100 mg/l	30 mg/l

Source: Agency of Meteorology & Environmental Monitoring, 2016.

g) Air Quality

199. Air quality monitoring was undertaken in September 2017 for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), dust (PM_{10}), and carbon monoxide (CO). The results show that air quality was in compliance for all parameters (**Table 32** to **Table 34**). However, it should be noted that air quality is significantly lower in the winter due to coal based heating.

Table 32: Nitrogen dioxide monitoring results (NO_2 μmg/m^3), September 1 - 8, 2017.

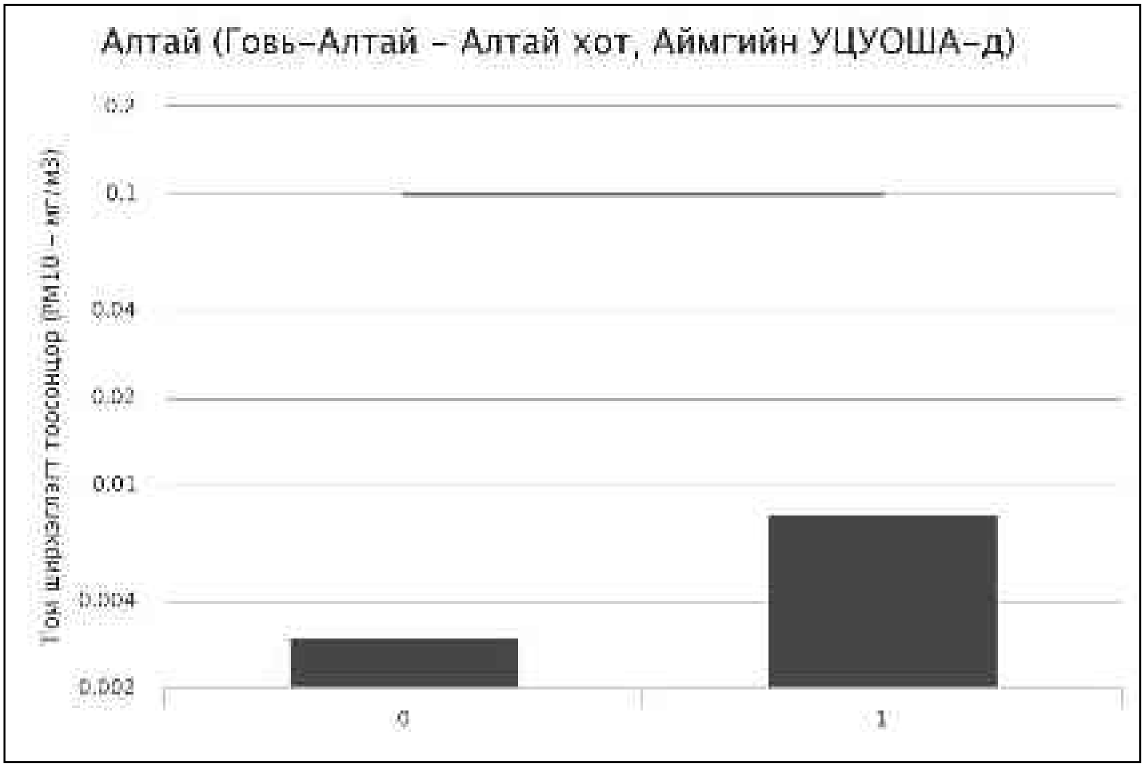


Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

Table 33: Sulfur dioxide monitoring results (SO_2 μg/m^3), September 1 - 8, 2017.

Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

Table 34: Particulate matter (PM_{10} µg/m^3), September 6 and 8, 2017.



Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

2. Ecological Resources

a) Flora

200. The site is a semi urban outskirt area, and has been affected by informal roads, garbage disposal and erosion. It is low value habitat with high rock cover, sandy soils and sparse, stunted vegetation of grasses and shrubs. Vegetation on the site and surrounding area includes *Stipa Mongolorum, Agropyron cristatum, Stellaria pulvinata, Crepis tectorium, Convolvulus ammanii, Allium-polyrrhizum*, *Astragalus galactites*, *Achnatherum splendens*, *Artemisia frigida*, *Potentilla acaulis,* and *Thymus gobicus*, all of which have no IUCN Red List conservation status. Weeds include *Peganum harmala, Urtica cannabina*, *Chenopodium album* and *Corisnermum mongolivus*, all of which have no IUCN Red List conservation status. All species found at the project site are common to the area, and surveys found no rare, endangered or protected species or areas of critical habitat.

Figure 62: Vegetation in the subproject area.

	
Ravine with needle-grass (*Achnatherum splendens*) polluted by domestic waste.	Informal road and associated erosion.
	
Agropyron cristatum	*Stipa krylkvii Roshev.*

Source: PPTA consultant, 2017.

b) Fauna

201. The subproject site is adjacent to an urban area, has limited vegetation cover, and is poor quality habitat. There are no large mammals utilizing the site. Animals that may be found on the site are typical for the urban periphery of Altai City, including the Red Fox (*Vulpes* – Least Concern IUCN Red List status), Corsac fox (*Vulpes corsa* – no IUCN Red List conservation status), and common unthreatened hares, marmots, and mice and moles. Birds in the area are typical of the Altai City urban periphery, and include common raven (*Corvus corax* – Least Concern IUCN Red List status), black kite (*Milvus migrans* – Least Concern IUCN Red List status), northern wheatear (*Oenanthe* – Least Concern IUCN Red List status), arctic warbler (*Phylloscopus borealis* – Least Concern IUCN Red List status), non threatened lark species, white wagtail (*Motacilla alba* – Least Concern IUCN Red List status), and hill dove (*Columba rupestris alba* – Least Concern IUCN Red List status). There are no known rare or endangered species of fauna within the subproject area.

c) Protected Areas

202. There are no parks, protected areas, nature reserves within or adjacent to the subproject site. This was confirmed through discussions with soum officials, a review of relevant Mongolian documentation, and a review of the IUCN World Database on Protected Areas. The nearest nature reserve (Khar Azargin Nuruu) is more than 40 km to the southwest.

3. Socioeconomic Profile

203. Altai City (Yesonbulag Soum) has a population of 18,108. The soum is divided into 10 bahgs, Bayankhairkhan, Bayanshand, Jargalant, Kharzat, Rashaant, Naran, Jinst, Indert, Tumen and Orgil. The majority of the population is in Orgil Bahg. Jargalant Bahg where the subproject is sited has a population of 1,927 (**Table 35**).

204. Almost 70% of the total soum population is working age, or between the ages of 16 and 59.

Table 35: Population of Altai City (Yesonbulag Soum).

Bahg	Population	Males	Females	Soum Total
Bayankhairkhan	2206	1053	1153	
Bayanshand	2270	1102	1168	
Jargalant	1927	928	999	
Kharzat	2067	991	1077	
Rashaant	128	338	309	
Naran	39	249	242	18,108
Jinst	1948	974	974	
Indert	2112	1033	1079	
Tumen	2081	1017	1064	
Orgil	2359	1164	1195	
Total	17137	8849	9260	

Source: Statistics Yearbook of Govi-Altai Aimag, 2016.

205. Traditional livestock husbandry is one of the key economic sectors in the soum, including sheep, goat, cattle, camel and horse. There are 489 herder households in the soum, owning over 200,000 livestock. Crop farming includes grains, potato, vegetables and fodder.

206. The site is served by good infrastructure, including an adjacent main road, an adjacent

airport. There are 17 post office branches and 7 radio stations in the soums. Internet is provided to 10 soums via fiber optic cable. Altai City has 6 schools and 9 kindergartens.

207. There are no known physical cultural resources at the site.

Table 36: Population Altai City (Yesonbulag Soum) by age.

Bahg	0-15	16-59	Above 60
Bayankhairkhan	646	104	155
Bayanshand	633	1506	131
Jargalant	632	1190	105
Kharzat	591	1352	124
Rashaant	208	399	40
Naran	160	305	26
Jinst	638	1229	81
Indert	658	1324	130
Tumen	604	1334	143
Orgil	721	1508	130
Total	5491	11552	1065

Source: Statistics Yearbook of Govi-Altai Aimag, 2016.

F. Altai Soum

1. Physical Resources

a) Geography and Topography

208. Altai Soum is located in Govi Altai Aimag in northwestern Mongolia. The soum town (also referred to as Bayan-Ovoo) is located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag. The soum town is on a flat plateau which gently slopes towards and across the China border to the west, and up to the Gobi-Altai Mountain range to the east (**Figure 64**). The subproject will rehabilitate the batteries in the existing wind farm to the east of the soum town (

209. **Figure 20 - Figure 22**), and install a new, small 2 turbine wind farm 500 m to the east of the existing farm. The site is an abandoned runway, and is completely flat at an elevation of 1,450 masl.

b) Land Use

210. The landing strip has not been used 27 years. The site is not currently used or occupied, and there are no houses or buildings on it. Site visits by the PPTA consultants and interviews with the Altai Soum Governor confirmed that the site is available for development, and will not require land acquisition and resettlement.

Figure 63: Location of Govi Altai Aimag and Altai City (Yesonbulag Soum).

Govi Altai Aimag

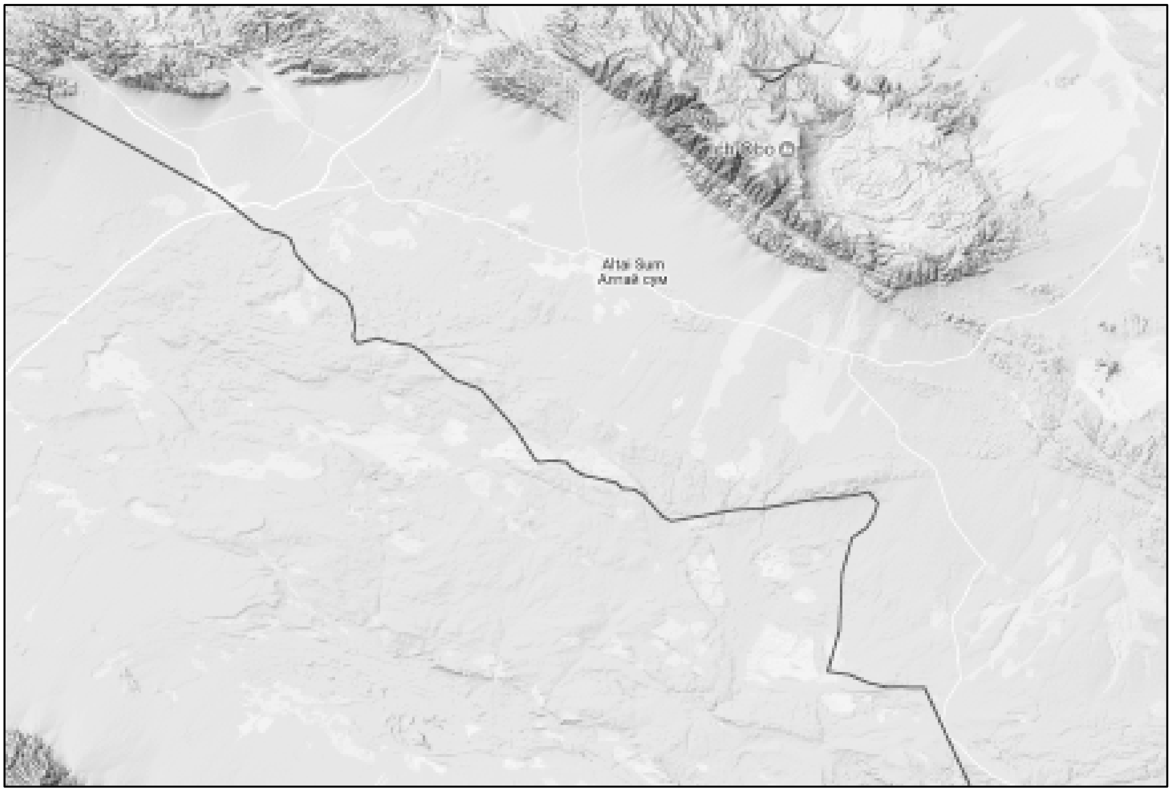
Altai Soum (circled in red)

Source: Wikipedia, 2017.

c) Soils

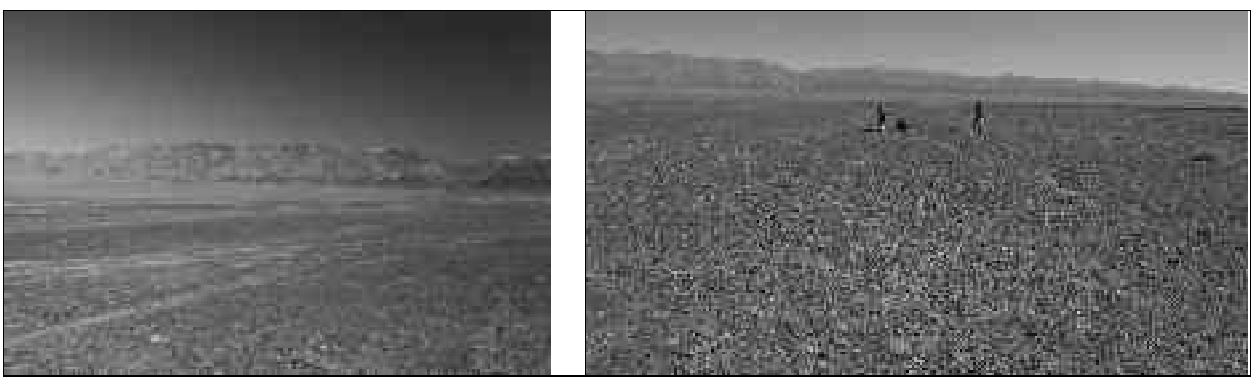
211. Site soils are typical of valleys in the area, semi-desert rocky brown sandy loams. As part of the DEIA investigations soil sections were dug to assess site soil properties, and samples were taken for laboratory analysis at the Soil Laboratory, Institute of Geography and Geoecology, Academy of Sciences.

Figure 64: Topography, Altai Soum area. Ich Ovoo mountain has an elevation of 3,802 masl.



Source: Google Maps, 2017.

Figure 65: Site conditions at subproject site.



Source: PPTA consultant, 2017.

212. Soil section 16-13 is representative of the site:

0 to 8 cm	Pale brown in color, covered by aeolian deposits of sand and small friable stones, texture is fragile, porous and interbedded, covering horizon is 0.05-1.6 cm, pale brown pulverescent, dense and loamy horizon underneath the covering horizon there are long thin dried plant roots, transition is gradual by color and bright by texture.

8 to 28 cm	Faded brown with reddish hue, dense, patchy long thin dried plant roots, texture is sandy, pulverescent and column-like, stones account for 50%, fully penetrated carbonate, reactive to hydrochloric acid, transition is gradual.
28 to 38 cm	Faded brown with reddish hue, friable stones account for 60%, dense, loamy and sandy component, film-like tough scales of carbonate under stones, reactive to hydrochloric acid.

Table 37: Chemical and physical properties of soils at Section 17-01, Altai Soum site.

Sampling depth, cm	**Humus, %**	**$CaCO_3$ %**	**pH**	**EC $_{2,5}$ ds/m**	**Dynamic element per 100 g soil, mg**		**Mechanical particles,% (size of particles, in mm)**		
					P_2O_5	K_20	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
Site description: Section 17-01, desert steppe brown sandy loam covered by rocks									
0 - 8	1.585	1.82	7.55	3.790	1.77	15.7	52.8	30.7	16.5
8 – 28	0.614	4.36	7.57	8.440	0.80	9.1	54.2	27.8	18.0

Source: Institute of Geography and Geoecology, 2017.

213. The humus content is low in the upper layers at 1.58% and decreases with depth to 0.62%. pH is uniform at 7.55 to 7.77. Electrical conductivity is lower in the upper layers. All layers are dominated by sand ranging from 52.8 to 54.2%.

Figure 66: Soil section 17-01, Altai Soum.

Source: PPTA soil expert, 2017.

d) Earthquake Risks

214. According to the Mongolia earthquake risk Modified Mercalli scale map produced by UN OCHA, the site is a Degree VI zone (**Figure 38**). The map indicates that the site is not in the high risk areas of Western Mongolia.

215. According to the World Bank GFDRR hazard screening tool ThinkHazard, the site is in a medium earthquake hazard risk zone, meaning that the potential impacts of earthquakes should be considered during design and construction.

e) Climate

216. Altai Soum has a northern continental climate characterized by long cold winters and short moist summers, but is considerably milder than the other subproject locations due to its more southerly location. The average annual temperature is 6.2°C. The coldest month is January with an average temperature of -12.0°C and a lowest recorded temperature of -30.5°C. The hottest month is July with an average temperature of 23.2°C and a maximum recorded high of 36.5°C. Air humidity ranges between 60-64% in wintertime and 54-58% in summertime. Average annual precipitation is only 52 mm in the soum center; 94% of precipitation falls in the warm period between April and October as rain, and only 6% as snow between November and March. The site area receives an average of 3,150 hours of sunlight per year.

217. Winds are predominantly from the west and northwest. The mean wind velocity from these directions is lowest in winter ranging 4.7-6.0 m/s and highest in spring ranging from 5.9-6.9 m/s. Annual mean wind speed, which is not dependent on wind directions, is 2.8 m/s.

218. Altai Soum is part of the Southern Altai Gobi Basin. Water resources in the soum are extremely limited. Precipitation is low, and rivers flowing from the mountains to the northeast evaporate or infiltrate into thick sediments easily. There no rivers or lakes in the soum town, though there are some small intermittent streams in the area, and the village is centered on a seep.

f) Flora and Fauna

219. Vegetation in the subproject site area is sparse with very limited diversity, partially due to low precipitation, and partially due to the wind farm site being on ex-industrial land (abandoned air strip). Vegetation is much higher at natural springs and seeps, including grasses, rushes and poplar groves, but there are none at the subproject site. There are no known rare or endangered species of flora or fauna within the subproject area.

g) Protected Areas

220. There are no parks, protected areas, nature reserves within or adjacent to the subproject site. This was confirmed through discussions with soum officials, a review of relevant Mongolian documentation, and a review of the IUCN World Database on Protected Areas. The nearest protected are to the site is the Great Gobi protected area, which at its closest is over 70 km to the southeast (**Figure 67**).

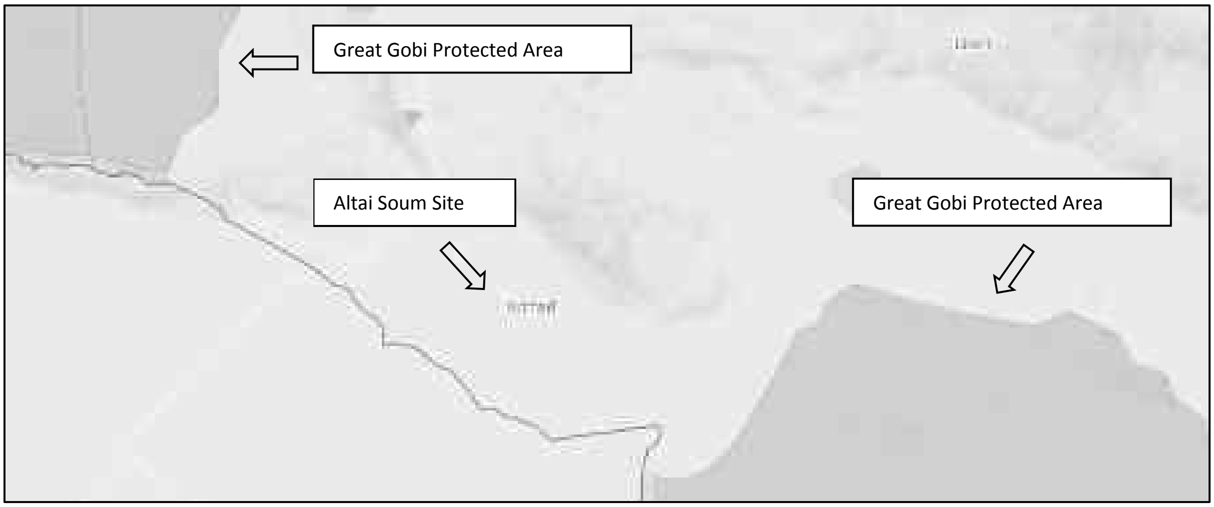
2. Socioeconomic Profile

221. Altai soum is divided into 4 bahg, Badral, Bayantsagaa, Long and Bayan-Ovoo. The

subproject is located in Bayan-Ovoo Bahg, the soum town. Altai soum has a population of approximately 2,100, with 1,050 people living in the soum town. Almost 70% of the soum population is between the ages of 16 to 59.

222. Traditional livestock husbandry is the key economic sector in Altai soum. There are 227 herder households in the soum, owning over 100,000 livestock.

Figure 67: Closest protected areas to the Altai Soum site.



Source: World Database on Protected Areas, IUCN, 2017.

Figure 68: Altai soum town, looking to the northeast.

Source: PPTA, 2017.

Figure 69: Altai Soum population.

Bahgs	**Population**	**Male**	**Female**
Badral	386	189	197
Bayantsagaa	299	148	151
Long	350	182	168
Bayan-Ovoo (soum town)	1046	521	525
Total	2082	1040	1042

Source: PPTA, 2017.

G. Khovd

1. Physical Resources

a) Geography and Topography

223. Khovd City is the capital of the Khovd Aimag, and is officially known as Jargalant Soum. The soum is situated in the northwestern portion of the Aimag (**Figure 70**).

Figure 70: Location Khovd Aimag and Khovd city (Jargalant Soum).

Uvs Aimag

Khovd (Jargalant Soum).

Source: Wikipedia, 2017.

224. A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1, a recently constructed two story building located on a 3,000 m^2 site in Takhilt Bahg, an urban Ger area in southern Khovd City (**Figure 27** and **Figure 28**).

225. Khovd City is located on an alluvial and diluvial plain at elevation of 1,405 masl. The city is surrounded by mountains of the Mongol Altai Mountain, including Khukh Serkh, Khar Uzuur, Botgon Uul and Baatarkhairkhan (**Figure 71**). Kindergarten 1 site topography is flat.

Figure 71: Topography in the general area, Khovd City.

Source: Google Maps, 2017.

Figure 72: Site conditions at Kindergarten 1, while under construction.

Source: PPTA consultant, 2017.

b) Land Use

226. The land at the site is occupied by the completed Kindergarten 1 **(Figure 28).** Previously the land was unoccupied and used informally for local traffic (**Figure 72**). Site visits by the PPTA consultants and interviews on land acquisition and resettlement with local authorities confirmed that the Kindergarten possess a 3,000 m^2 land license.

Figure 73: Previous landuse at the Kindergarten 1 site.

Source: Google Earth, 2017.

c) Soils

227. Site soils are pale brown sandy loams. Soil section 15-01 is representative of the site:

0 to 20 cm	Faded brown soil, with many plant roots in upper part, texture is sparse, small stones are 20%, light silt and small friable rocks
20 to 40 cm	Pale gold, dense, penetrated with carbonate, pulverescent, sandy, friable rock-30%, transition is gradual
Below 40 cm	Reddish gold, dense, sandy

Table 38: Chemical and physical properties of soils at Section 15-01, Khovd site.

Sampling depth, cm	**Humus, %**	**$CaCO_3$ %**	**pH**	**EC $_{2,5}$ ds/m**	**Dynamic element per 100 g soil, mg**		**Mechanical particles,% (size of particles, in mm)**		
					P_2O_5	K_20	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
Site description: Section 15-01, desert steppe degraded pale brown sandy clay loam covered by pebbles									
0 –20	0.194	2.51	8.28	0.266	0.18	4.6	55.7	35.3	9.0
20– 40	0.448	5.96	8.32	0.540	0.37	17.2	59.4	24.1	16.5

Source: Institute of Geography and Geoecology, 2017.

228. Soil humus content ranges from 0.194 - 0.448%, and pH ranges from 8.28 - 8.32. Soil carbonates are not found in the upper layers, but are very high in the lower part reaching 5.96%. The soil is alkaline and electrical conductivity is weak in lower strata (EC 2.5 = 0.540 ds/m) and slightly saline. As for the soil separates, all layers are dominated by sand ranging from 55.7 to 59.4%.

Figure 74: Soil section 15-01, Khovd.

Source: PPTA soil expert, 2017.

229. Overburden is quite extensive in the site area, and when drilling test wells (see below) bedrock was only encountered at 36 to 51 m.

d) Earthquake Risks

230. According to the Mongolia earthquake risk Modified Mercalli scale map produced by UN OCHA, the site is a Degree VII zone (**Figure 38**). The map indicates that the site is not in the high risk areas of Western Mongolia.

231. According to the World Bank GFDRR hazard screening tool ThinkHazard, the site is in a low earthquake hazard risk zone, meaning that there is a 2% chance of potentially-damaging earthquake shaking in the project area in the next 50 years, but the potential impacts of earthquakes should still be considered during design and construction.

e) Climate

232. Khovd has a northern continental climate characterized by long cold winters and short moist summers (**Figure 75**).

233. The average annual temperature is 0.1°C. The coldest month is January with an average temperature of -17.1°C and a lowest recorded temperature of -40.2°C. The hottest month is July with an average temperature of 16.6°C and a maximum recorded high of 38.7°C.

234. Average annual relative humidity is 58% and average annual precipitation is only 128 mm. Approximately 70% of average annual precipitation (90 mm) falls in summer months. Snow contributes less than 13% to the total annual precipitation. The first snowfall occurs in late September to early October. Average snow depth is about 5-10 cm in January and February and may reach up to 20 cm. The site area receives an average of 2,925 hours of sunlight per year.

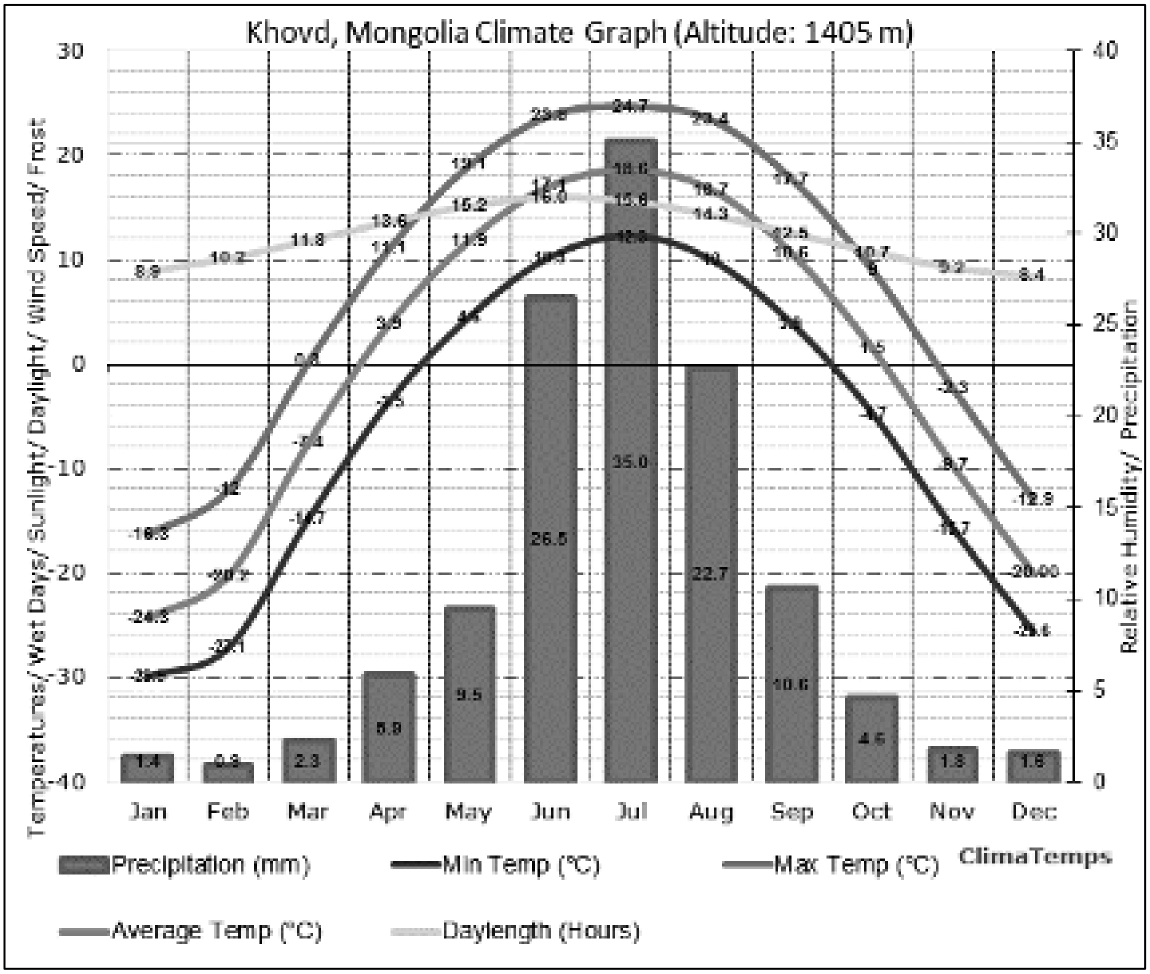
235. The predominant wind direction is from the south and southwest in the wintertime (54.2%), though in summer wind directions are more varied (**Table 39**).

f) Water Resources

236. Khovd City is situated on the banks of the Buyant River, which discharges into the Khovd River and then Khar Us Lake. The subproject site is in an urbanized portion of Khovd City, and has no surface water resources on or near it. The Kindergarten is connected to the municipal water supply system.

237. Drilling at two sites in Khovd determined that the groundwater level is between 25 to 30 m depth. It was observed that the groundwater level in the wells stabilized 5 to 7 m above the original level that the water was detected.

Figure 75: Khovd climatogram.



Source: ClimaTemps.com, 2017.

Table 39: Seasonal wind directions, average wind speed (m/s), and frequency of windless periods (%), Khovd City.

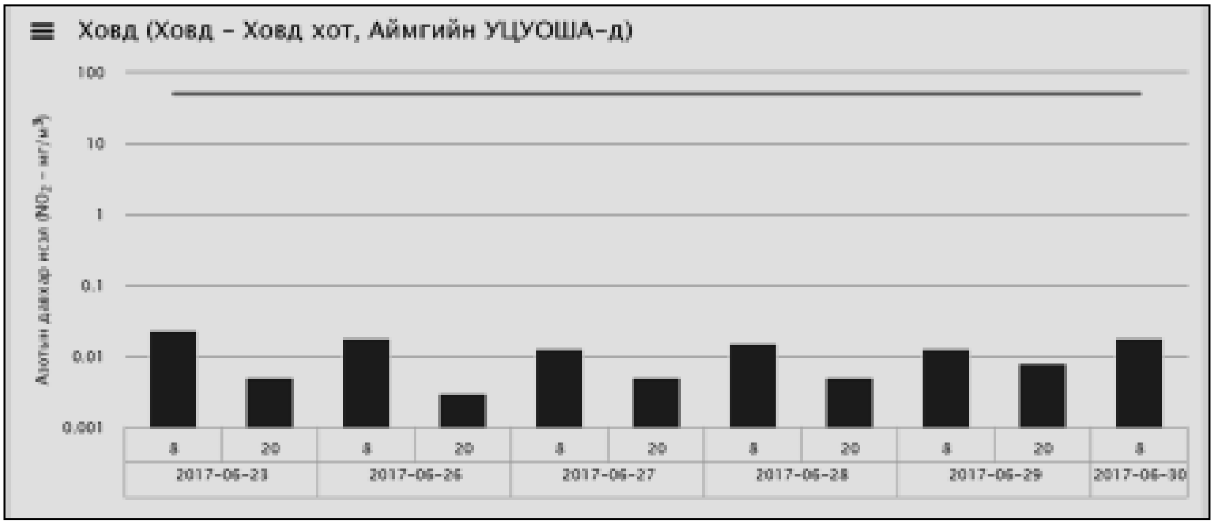
Quarter	Parameter	N	NE	E	SE	S	NW	W	SW	Windless (%)
1	Frequency%	12.8	4.4	4.3	10.6	37.6	16.6	7.4	6.3	71.3
	Speed m/s	2.1	1.2	1.5	1.6	2.1	2.6	2.5	2	
2	Frequency%	9.3	9.1	16.8	11.5	16.1	17.5	13.4	6.3	41.0
	Speed m/s	3.2	3.4	3.8	3	2.7	5.7	6.7	5.4	
3	Frequency%	11.1	13.9	18	13.6	14	15.1	8	6.2	51.4
	Speed m/s	3.1	3.2	3.1	3.1	2.6	4.4	2.2	3.6	
4	Frequency%	10.2	9.7	9	9.3	25.3	20	11	5.5	52.7
	Speed m/s	1.9	3.2	3.0	2.7	2.4	3.9	5.6	4.9	

Source: PPTA climate expert, 2017.

g) Air Quality

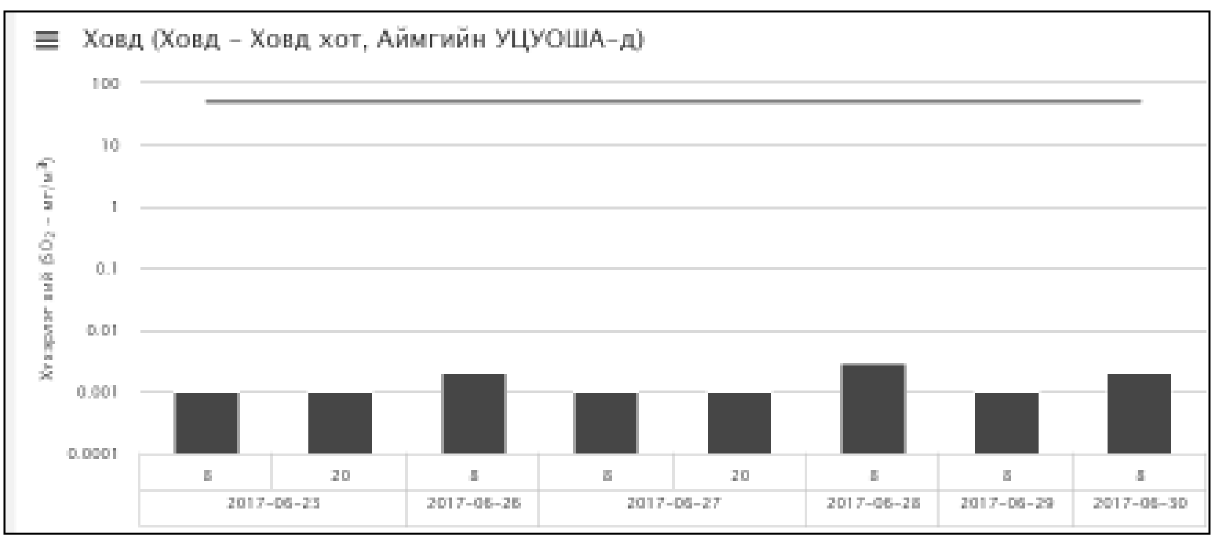
238. Air quality monitoring was undertaken in June 2017 for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and dust (PM_{10}). The results show that air quality was in compliance for all parameters. However, it should be noted that air quality is significantly lower in the winter due to coal based heating.

Table 40: Nitrogen dioxide monitoring results (8 and 20 hour averages, NO_2 mg/m^3), June 23-30, 2017.



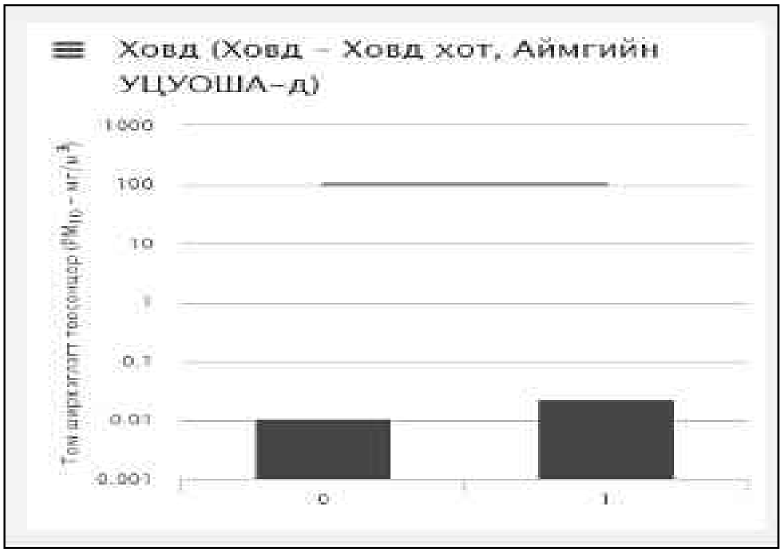
Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

Table 41: Sulfur dioxide monitoring results (8 and 20 hour averages, NO_2 mg/m^3), June 23-30, 2017.



Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

Table 42: Particulate matter (8 hour PM_{10} mg/m^3), June 27 and 29, 2017.



Note: Red line denotes Mongolian air quality standard (MNS 4585: 2007).
Source: DEIA consultants, 2017.

2. Ecological Resources

239. The subproject site is in an urbanized portion of Khovd City. Prior to construction the site was an informal road, with no vegetation cover. The 3000 m^2 site has been completely developed, and has no flora or fauna of ecological value, and no critical habitat. It does not contain any rare or endangered species.

240. There are no parks, protected areas, nature reserves within or adjacent to the subproject site.

3. Socioeconomic Profile

241. Khovd City (Jargalant Soum) has a population of approximately 29,000 in 7,810 households (**Table 23**), including 14,243 men and 14,779 women. The soum has an area of about 2,550 km^2, of which 1,470 km^2 are pasture. Administratively, the soum is divided into 12 bahg. Takhilt Bahg, where the subproject is located, has a population of 1,868 in 487 households.

242. The soum population is comprised of over 10 ethnic groups, including Uuld, Khalkha, Zakhchin, Torguud, Uriankhai, Myangad, Dorvod, Bayad, Kazak and Uzemchin.

243. Traditional livestock husbandry is one of the key economic sector in Khovd City, including sheep, goat, cattle, camel and horse. In 2016 the soum had 114,000 thousand livestock.

244. There are 1,314 economic entities operating in the soum, accounting for 60.4% of those in the Aimag. There are 7 secondary schools with over 9,000 students, and 11 kindergartens with 1,700 pupils. Over 2,500 students study at Khovd University, an affiliate of State University of Agriculture and Khovd-Erdem Institute.

Table 43: Khovd City (Jargalant Soum) population, by bahgs.

Bahg	Population	Household
Bahg 1 Alagtolgoi	2190	584
Bahg 2 Baatarkhairkhan	2503	672
Bahg 3 Bichigt	2852	734
Bahg 4 Bugat	2656	703
Bahg 5 Buyant	2941	790
Bahg 6 Jargalan	1908	550
Bahg 7 Magsarjav	2330	672
Bahg 8 Naran	2793	708
Bahg 9 Rashaant	2276	606
Bahg 10 Takhilt	1868	487
Bahg 11 Khairkhan	1954	537
Bahg 12 Tsambagarav	2751	767
Total	**29022**	**7810**

Source: Statistics Yearbook of Khovd Aimag, 2016.

Table 44: Khovd City (Jargalant Soum) population composition by age.

All	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
29022	3770	3127	2076	2568	2823	3003	2162	1797	1822	1709	1497	1088	581	999

Source: Statistics Yearbook of Khovd Aimag, 2016.

Table 45: Khovd City (Jargalant Soum) livestock.

Number Livestock				
Camel	Horse	Cattle	Sheep	Goat
235	5728	9918	37595	60527
Number Breeding Livestock				
Female camel	Mare	Cow	Female sheep	Female goat
48	1778	3785	16022	25480

Source: Statistics Yearbook of Khovd Aimag, 2016.

245. Although Khovd City is quite isolated, energy, road and communications infrastructure development is better than some other communities in western Mongolia. Currently there is 19 km of paved road, 17 km of clean water pipeline, 16 km of wastewater pipelines, 28 km of communication lines, and 50 km of electricity lines. There are also medical facilities, mobile phone providers and a post office.

246. There are a number of PCRs in and around Khovd City, including temples (such as Jargalantyn Dugan temple dating from 1890) and statues (Amarsanaa, Ard Ayush, Shar Sum, Galdan Boshigt Khan). However, there are no known PCRs at the site, and none were encountered during the kindergarten construction.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Assessment of Impacts

247. Anticipated positive and negative environmental impacts of the proposed Project were assessed based a Project domestic FSR[11]; GEIA[12] report; site visits and field surveys conducted by domestic and international environmental consultants; CRVA; screenings utilizing the IBAT developed by BirdLife International, Conservation International, IUCN and UN Environment's World Conservation Monitoring Centre; screening utilizing the World Bank GFDRR hazard screening tool ThinkHazard; screening utilizing the Mongolia earthquake risk Modified Mercalli scale map produced by the United Nations OCHA; and, stakeholder and public consultation meetings.

248. Pre-construction, construction, operation and decommissioning phases were each considered separately. Potential impacts and proposed mitigation measures are discussed below. Mitigation measures are presented in detail in the subproject EMPs (sub-EMPs, **Appendices I** through **V**).

B. Anticipated Pre-construction Phase Impacts and Mitigation Measures

249. Pre-construction phase negative impacts are typically associated with any permanent land acquisition and associated loss of land and/or structures. As all subproject works will take place on government owned unoccupied land and will be no land acquisition for any of the subprojects. In addition, it has been confirmed through discussions with local officials that the subproject sites are not used for grazing or other purposes. Thus, there are no associated impacts or mitigation measures required.

250. A number of environmental management measures will also be implemented in the pre-construction phase during detailed design, including IEE and sub-EMP updating (if necessary); incorporation of environmental mitigation measures into contractor's bidding documents, technical specifications, and contracts for civil construction and equipment installation; implementation of the GRM; and training and capacity building.

1. Mitigation Measures and Monitoring during Detailed Design

251. The following environmental management activities will be implemented during pre-construction.

IEE and sub-EMP Updating

252. The IEE and subproject sub-EMP will be updated if required to take into account any design changes or new information. The environmental mitigation measures indicated in the updated IEE and sub-EMPs will be incorporated into the detailed design. ADB will review and

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[11] Upscaling Renewable Energy Sector Project Feasibility Study. Prepared by INTEGRATION environment & energy GmbH in association with Mon-Energy & Profec. Ulaanbaatar, 2018, under TA-9224 MON: Upscaling Renewable Energy Sector Project – PPTA Consultants (the PPTA).

[12] Upscaling Renewable Energy Sector Project General Environmental Impact and Feasibility Study. Prepared by INTEGRATION environment & energy GmbH in association with Mon-Energy & Profec. Ulaanbaatar, 2018 under the PPTA.

approve any revisions to the IEE and sub-EMPs.

Bidding Documents and Contracts

253. Environmental mitigation measures indicated in the updated IEE and sub-EMPs will be included in the subproject contractor's bidding documents, technical specifications, and contracts.

Earthquake Risk

254. A detailed assessment of earthquake risks will be undertaken, and the result incorporated into the subproject designs as appropriate.

Subproject Construction Environmental Management Plan (CEMP)

255. The subproject contractors will develop CEMPs that outline the manner by which they will comply with the requirements of the IEE and sub-EMPs.

Grievance Redress Mechanism

256. In accordance with the GRM presented in Chapter VIII of the IEE, the EA Project Management Unit (PMU) will be assigned overall responsibility for the GRM; GRM training will be provided for EA PMU, subproject IA Project Implementation Units (IA PIU) members and GRM access points; the IA PIUs will issue public notices to inform the public within the project area of the GRM; and contact information (phone number, fax, address, email address) for the IA PIUs and local entry points (e.g. contractors, bahg or soum Citizens Representative Hurals, and/or bahg or soum government representatives) will be disseminated at construction sites.

Training and Capacity Building

257. Institutional strengthening and training program will be delivered by a national Independent Environmental Consultant (IEC). The training will focus on ADB's and Mongolia's environmental, health and safety laws, regulations and policies; implementation of the sub-EMPs, including chance find procedures for PCRs, spill prevention and management, etc.; and the GRM. Training will be provided to the subproject contractors, subproject IA staff, and relevant EA PMU staff.

Consultation and Outreach

258. Information disclosure and consultation activities will be continued with affected people and other interested stakeholders.

C. Anticipated Construction Phase Impacts and Mitigation Measures

259. Potential negative Project construction phase environmental impacts are low in magnitude, short to medium term in duration, and very localized in scale. They are associated with land preparation for the solar farms and wind turbines, installation of the RE equipment, and other construction activities. Localized impacts may include soil erosion, construction noise, fugitive dust, wastewater, solid and hazardous waste, and risks to worker and community health and safety. No cultural or heritage sites will be affected nor will any critical habitat. Potential negative construction phase impacts can be effectively mitigated through the application of appropriate good international construction practices and compliance with national laws and regulations and

international guidelines including the *General EHS Guidelines,* the *EHS Guidelines for Wind Energy* and the *EHS Guidelines for Geothermal Power Generation.*

1. Impacts on Physical Resources

a) Erosion, Borrow and Spoil

Potential Impacts

260. Construction activities such as land leveling, excavation and filling may lead to localized surface erosion and runoff and the generation of spoil. Soil erosion can be more serious on slopes or near water bodies, and can also occur after the completion of construction if site restoration is inadequate. However, the subproject sites are generally flat, and not adjacent to water bodies, critical habitat or sensitive receptors such as residences, schools or hospitals. The Khovd GSHP is an exception in that it is situated within a school in a residential area, however construction works are very minor and are not expected to result in erosion. Overall, impacts will be minor in scale, short-term in duration, and localized.

Mitigation Measures

261. These potential impacts, though minor, will be effectively mitigated through good site maintenance practices including erosion control and managing storm water runoff.

b) Air Pollution

Potential Impacts

262. Anticipated sources of air pollution from construction activities include: (i) dust generated from earth excavation, filling, loading, hauling and unloading; (ii) dust generated from disturbed and uncovered construction areas, especially on windy days; (iii) dust generated from construction material storage areas, especially on windy days; (iv) dust generated by the movement of vehicles and heavy machinery on unpaved access and haul roads; (v) dust generated from aggregate preparation and concrete-mixing; (vi) equipment emissions (gaseous CO and NO_2 from transport vehicles and heavy diesel machinery and equipment); and, (viii) GSHP heat exchanger refrigerants, which can be an ozone depleting substance .

263. Impacts at the subproject sites will be localized and short-term in duration, and are unlikely to impact residents in any of the subprojects as the solar and wind subprojects sites are not adjacent to residential areas, and for the Khovd GSHP subproject, construction activities will generate minimal amounts of dust. Impacts of vehicle emissions along access routes will not result in any predicted exceedances of air quality standards, and will be small in scale compared to other vehicle emissions.

Mitigation Measures

264. These potential impacts, though minor, can be effectively mitigated through good site and equipment management practices, including covering transportation loads, and managing construction traffic to avoid residential neighborhoods. Due to limited water resources, site spraying will only be utilized when necessary and if sufficient water resources are available.

265. In the past heat exchangers used chlorodifluoromethane, an ozone depleting substance,

as a refrigerant. Although harmless while contained, leaks and improper end-of-life disposal contribute to enlarging the ozone hole. The Khovd GSHP will utilize environmentally friendly refrigerants such as R290 or R32, both of which have a low global warming potential (GWP), and a zero Ozone Depleting Potential (ODP).

c) Equipment Procurement

266. It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.

d) Wastewater

Potential Impacts

267. Inappropriate disposal of domestic wastewater (from construction workers) or construction wastewater (from drainage of excavation and drilling, washing aggregates, washing construction equipment and vehicles, pouring and curing concrete, and oil-containing wastewater from machinery repairs) may cause soil or groundwater resources contamination. Potential impacts will be localized to the construction sites and primarily relate to the new solar and wind farms.

Mitigation Measures

268. These potential impacts will be mitigated through good wastewater management practices, including provision of sanitation facilities for workers, management of construction wastewater, and off-site maintenance of construction equipment and vehicles.

e) Groundwater

Potential Impacts

269. Inappropriate drilling techniques and poor site management could lead to potential contamination of the aquifer at the Khovd GSHP subproject.

Mitigation Measures

270. These potential impacts will be mitigated through good site management practices, including wastewater management (see above) and management of hazardous and polluting materials (see below). Well drilling will be undertaken in accordance with good international practice as noted in the *EHS Guidelines for Geothermal Power Generation* to minimize the impact of drilling fluids and cuttings. Wells will be grouted and sealed with a thermally conductive bentonite grout in accordance with international good practice.

f) Noise

Potential Impacts

271. During the construction phase noise and vibration will be generated by on site construction activities using heavy equipment such as bulldozers and excavators, and by the transport of

construction materials. This is only expected to be a factor in the Khovd GSHP subproject, as the other subprojects do not have any nearby residences. Overall, potential noise and vibration impacts are anticipated to be very minor.

Mitigation Measures

272. These potential impacts will be effectively mitigated at the Khovd site through good construction noise management measures, including scheduling construction during school holidays (if practical), limiting working hours, using noise barriers if necessary, using low noise equipment, and equipping machinery with mufflers in accordance with relevant government requirements.

g) Solid Waste

Potential Impacts

273. Solid waste generated in the construction phase may include construction and domestic wastes. Construction wastes include a large amount of packaging materials for the solar panels, various building materials such as steel, timbers and rubble, and other types of waste. Domestic wastes include organic and inorganic matter, and an estimated 0.4 kg/day per worker of domestic waste. Inappropriate waste storage and disposal could affect soil, groundwater, and surface water resources, and hence, public health and sanitation.

Mitigation Measures

274. These potential impacts will be effectively mitigated through good waste management practices, including the adoption of the waste hierarchy, providing recycling and waste containers at all construction sites, recycling all materials to the extent possible, and collecting and disposing remaining wastes at appropriate waste disposal sites following national regulations. Waste burning on subproject sites will not be allowed.

h) Hazardous and Polluting Materials

Potential Impacts

275. Inappropriate transportation, storage, use, disposal and spills of petroleum products and hazardous materials and wastes can cause soil, surface and groundwater contamination. As noted in Section II, under Mongolia's hazardous waste classification list (2015) Li-Ion batteries are classified as hazardous waste under waste classification code "16 06 06 - other batteries and accumulators". The list makes no reference to solar panels, though wastes from electrical equipment containing PCBs, HCFCs, HFCs, asbestos and other hazardous components are also classified as hazardous waste.

Mitigation Measures

276. These potential impacts will be effectively mitigated through good practice hazardous materials management in accordance with relevant GoM regulations. This will include appropriate hazardous materials transport, storage and disposal.

2. Impacts on Ecological Resources

a) Flora and Fauna

Potential Impacts

277. Surveys indicate that there is no critical habitat, rare or endangered flora and fauna or areas of natural forest at or immediately adjacent to any of the subprojects. Therefore, construction activities, including limited vegetation clearance, are not expected to have any impact on these resources.

278. The Umnugovi and Uliastai subproject sites can be considered natural dry grassland habitat.[13] The subprojects are in sparely populated undeveloped and remote areas of Western Mongolia, and the areas of the sites to be developed are small. In Umnugovi it will consist of land for the 5 wind turbine towers, access roads and the right of way for the connecting line, and for Uliastai it consists of the 600 x 130 m solar PV site. The land that will be developed is very small compared to the vast areas of dry grassland habitat in the subproject areas, and does not constitute a significant conversion or degradation of the natural habitat. The Govi Altai, Altai Soum and Khovd subproject sites can be considered modified habitat. The project will not significantly convert or degrade these areas.

279. The Umnugovi subproject is located within 11.5 km of the shores of Uvsiin Khar Us Lake, which has been designated an IBA, though local officials report that it is currently saline and turbid and is a poor waterfowl habitat. Nonetheless, inappropriate construction activities could lead to lake pollution and impacts on critical habitat and national and globally important species if such are indeed present.

Mitigation Measures

280. In general, impacts are low and will be effectively managed through good construction measures such as erosion and waste water control.

281. With respect to the Umnugovi subproject, the Uvsiin Khar Us Lake IBA will be designated as a no-entry area by construction equipment, and no harvesting or collection of birds and other wildlife will be allowed. Above mentioned erosion and stormwater control measures will ensure that the lake is not contaminated due to erosion or stormwater runoff.

b) Parks and Protected Areas

Potential Impacts

282. None of the subprojects are located in or near any parks or protected areas, and no mitigation measures are required.

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[13] Land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions (ADB SPS, 2009).

3. Impacts on Socio-Economic Resources

a) Traffic and Roads

Potential Impacts

283. Materials, goods and workers will be transported to and from the projects site via roads. Construction has a potential to cause impacts on traffic and access roads to the subproject sites.

- Transport of construction materials and heavy loads can result in congestion and potential safety risks.
- Transportation of heavy equipment and loads may cause damage to roads, including surface damage and subsidence.

284. However, the subprojects are relatively small as is anticipated construction traffic, and road traffic in the communities is also low; impacts are expected to be low in magnitude, scale and duration.

Mitigation Measures

285. These modest impacts can be effectively mitigated through good traffic and road management practices, including planning transportation routes and delivery schedules in consultation with relevant road management authorities.

286. Any damage caused by construction traffic will be repaired by the relevant subproject contractor at their own cost.

b) Workers Occupational Health and Safety

Potential Impacts

287. Subproject construction may cause physical hazards to workers from electrical shocks, noise and vibration, dust, handling heavy materials and equipment, traffic, falls and falling objects, work on slippery surfaces, fire hazards, chemical hazards such as toxic fumes and vapors, disease, and others. These health and safety hazards pose a significant risk that will be present throughout the construction period.

Mitigation Measures

288. To minimize health and safety risks the subproject contractors will implement good practice Occupational Health and Safety (OHS) measures including the use of Personal Protective Equipment (PPE) and emergency response procedures, developed in compliance with relevant GoM regulations, and HIV/AIDS orientation and training.

c) Community Health and Safety

Potential Impacts

289. Project construction has the potential to cause community disturbance such as traffic congestion or delays, and public safety risks from construction activities, heavy vehicles and machinery traffic, fires, spills of materials, and risk associated with unauthorized entry into work areas. In addition, workers camps and an influx of migrant workers may cause social conflict or

even lead to the spread of disease. These potential impacts are low to moderate in significance, and medium term in duration during the project construction period.

Mitigation Measures

290. To mitigate these potential impacts, in addition to traffic safety measure noted above, subproject contractors will implement good community health and safety practices, including outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language), and on site supervision personal (including night guards) as determined by the risk, to prevent unauthorized access to construction areas.

291. With respect to the recruitment of workers, workers will be locally recruited to the extent practical, and will receive health examinations and education on sexually transmitted diseases. Worker camps will be avoided, and contractors will arrange for workers to stay in locally rented houses that are equipped with power, water supply, cooking facilities and adequate sanitation facilities (at minimum, pit latrines that are not located near wells or surface waters).

d) Physical Culture Resources

Potential Impacts

292. Based on field surveys there are no known PCRs at or near the project sites. However, construction activities have the potential to disturb as yet unknown PCRs.

Mitigation Measures

293. A construction phase chance find procedure will be established and activated if any chance finds of PCRs are encountered:

- construction activities will be immediately suspended if any PCRs are encountered;
- destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with Mongolian regulations;
- the local Cultural Heritage Bureau will be promptly informed and consulted; and,
- construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.

D. Anticipated Operation Phase Impacts and Mitigation Measures

294. Operation of the RE subprojects will not produce any air pollution. Small amount of nontoxic wastewater will be generated during cleaning of solar farm panels and from domestic sewage, and noise will be generated from wind turbines. However, there are some moderate potential negative impacts during the operation phase, including the risk of glare from the solar panels, potential for bird strikes on both solar and wind farms, risks to TL worker health and safety, and risks to community health and safety. Potential operation phase impacts can be effectively mitigated through good design, the application of appropriate good operational management practices, compliance with relevant GoM standards, and compliance with international good practices including the *General EHS Guidelines,* the *EHS Guidelines for Wind Energy,* and the *EHS Guidelines for Geothermal Power Generation*.

1. Water Use

Potential Impacts

295. Solar PV farms often use water to clean panels to maintain high panel efficiency. A typical assumption is 1-3% loss over a year due to dust collection, less with steep panel tilting, and more when sandstorms and heavy dust are frequent. Water resources at the subproject solar farm sites are limited, and excessive cleaning could deplete water sources.

296. The cost of cleaning must be balanced against potential power losses. Unlike concentrated solar power (CSP) plants where a highly polished surface is critical for performance, PV cleaning is more about removing caking around the lower edges of the panels. In northern areas operators typically rely on self-cleaning by rains and snow sliding off the surface. In Mongolia winter snows and summer rains can be expected to be relatively effective in cleaning panels.

297. There is a potential for the GSHPs to lead to contamination of the aquifer, to affect groundwater availability, and to create thermal impacts.

Mitigation Measures

298. The subproject solar farms will make limited use of water for cleaning purposes. Well water will be avoided as calcified water can do more harm than good. Civil works will include rainwater catchments so as to avoid the necessity of relying on well water or municipal (potable) water. It is estimated that cleaning will require 5 l/m^2, 2 times per year (April and August). Rainfall ranges from 50 to 200 l/m^2 in the solar PV subproject areas, and should be sufficient to meet cleaning requirements.

299. The Khovd GSHP will utilize a closed loop. The heat exchanger will circulate the liquid (water and antifreeze) in a closed loop system of pipes buried underground. The heat exchanger will transfer the heat between the refrigerant in the heat pump and the antifreeze solution circulated through the pipe. There will be no utilization of ground water or risk of water loss in adjacent wells, and operation of the system will not generate any pollutants. The heat pump merely removes or adds heat to the ground. Further, as the system will not be utilized for cooling in the summer, there will be no risk of the creation of a thermal plume.

300. To avoid potential groundwater contamination the wells will be sealed with a thermally conductive bentonite grout. In addition, Monopropylene glycol will be used as the antifreeze. It is a viscous colorless liquid which is nearly odorless. Due to its low toxicity it is used in a range of products including foodstocks and e-cigarettes. It is the only allowed anti-freeze allowed in GSHPs in an increasing number of European countries.

2. Solar Panel Glare

Potential Impacts

301. The potential for glare impacts from the Uliastai and Govi Altai subproject to negatively affect the adjacent airports/airfields and road users (the latter for Govi Altai only) has been investigated and assessed by the PPTA international and national PV solar experts. Solar glare describes the reflection of the sun´s rays from solar surfaces which might impede the sight of drivers and pilots (there are no adjacent residents). Solar surfaces can be panels of PV arrays

and solar mirrors for CSPs (**Figure 76**). PV panels have solar cells with antireflective coating and are designed for minimum reflection in order to obtain maximum irradiation.

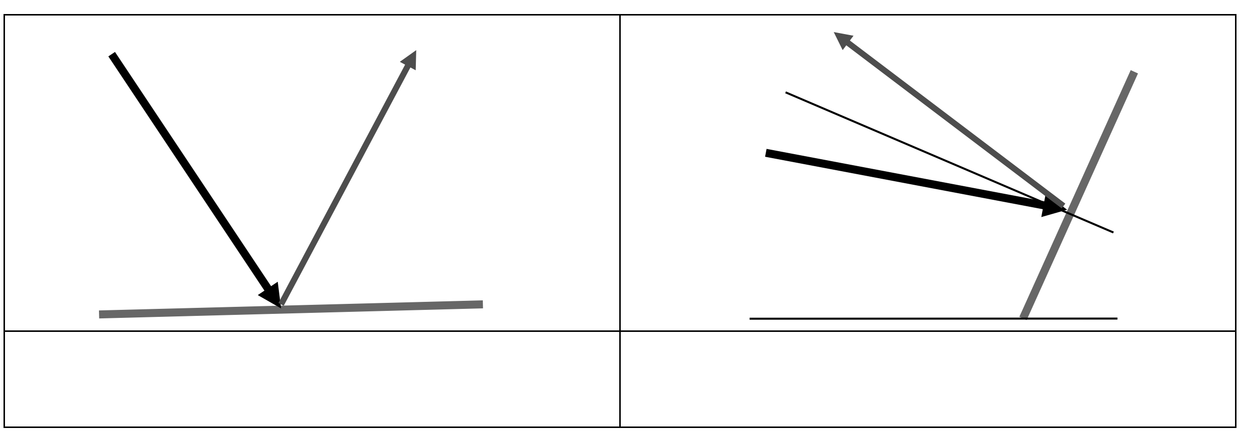
Figure 76: Example of CSP solar glare.

Source: PPTA consultant, 2017.

302. For aircraft, the glare effect is well known from practically any reflective horizontal surfaces, such as seas, lakes and rivers. Geometry dictates that the angle of the incoming beam equals the angle of the reflected beam. On horizontal surface this is always the case. Solar PV array are tilted, however, and reflection towards the sky will only happen when the incoming beam angle is below the tilt angle (**Figure 77**).

303. In Mongolia, the PV arrays will be tilted strongly in order to maximize the winter sun. Reflection will therefore only happen at times when the sun angles are below the tilt angle i.e. at low and weak sun irradiation. The design will ensure that the frequency of this happening will be low for the selected sites. Further, reflection can reach altitude, e.g. of planes, only the more distant the two are apart. In both Uliastai and Govi Altai the PVs array are close to the airfields, so the reflection risk is very low.

Figure 77: Example of solar glare from horizontal and angled surfaces.



Source: PPTA consultant, 2017.

304. In addition, the solar arrays are aligned roughly in parallel to the adjacent road to Khovd (Govi Altai) and the airfields (Govi Altai and Uliastai). Vehicles and aircraft starting and landing will therefore never look into the direction of the solar panels, which will be facing to the south; this practically excludes the risk of reflection impeding the driver/pilot´s sight.

305. The rehabilitated Altai Soum solar farm also has the potential to impact local residents. However, as no glare impacts have been reported from previous operation of the farm, this risk appears negligible.

Mitigation Measures

306. The Uliastai and Govi Altai solar farm has been designed to minimize the risk of solar glare to drivers on the adjacent road the airfield. Specifically:

- the Uliastai and Govi Altai PV array will have non-reflective surface coatings;
- the Uliastai and Govi Altai PV arrays will be parallel or almost parallel to the landing strips and strongly tilted to the south, so reflection will not be in the line of vision of incoming or exiting planes;
- the Uliastai and Govi Altai solar farms will be close to the airfields so reflection risk is low; and
- the Govi Altai PV array will be parallel to the adjacent road to Khovd, but panels will be facing to the south, and should not affect traffic.

3. Flooding

Potential Impacts

307. The Umnugovi subproject is more than 9 km from the Namir River, and river flooding does not pose a risk to it. The Govi Altai subproject also does not have any adjacent rivers that poses a flooding risk. However, both sites are at some risk of overland flash flooding, though according to the Mongolian Flash Flood Occurrence Map the risk is low.[14] The Altai Soum subproject also does not have risks from an adjacent river, but is in a flash flood risk area according to the Mongolian Flash Flood Occurrence Map.

308. The Uliastai subproject is at risk of flooding from the Chigestei River approximately 1 km to the southeast. Local officials indicate that flood risk is low, and river flooding at the subproject site or the substation (which is closer to the river than the solar site) has not been reported. This is supported through satellite imagery, which shows the river is heavily braided but contained within the outer banks.

309. There are no known flooding risks at the Khovd subproject.

Mitigation Measures

310. Flood control dykes will be built to protect the PV and wind sites. The risk will be assessed

[14] Flash flood occurrence map by river basins, Country water security assessment. Main report. Unpublished material.

further during detailed design.

4. Hazardous and Solid Waste

Potential Impacts

311. Wastes generated from operation of the subprojects could include transformers and other electrical components, solar panels and Li-Ion batteries. Toxic chemicals and hazardous wastes can have negative impacts on human health and the environment if not appropriately managed. Small amounts of domestic solid waste will also be generated at the subproject sites.

Mitigation Measures

312. PV panels in general are expected to last for approximately 20 years before replacement is required, though during operation some will fail earlier than that or be faulty. A typical crystalline (c-Si) solar module consists of either monocrystalline or polycrystalline silicon cells (typically 60 six inch cells) connected together electrically with aluminum/silver grids and back contacts. The cells are encapsulated within a polymer substance between the back sheet PV film and the module glass surface (almost 80% of the module). The module is surrounded by an aluminum frame and has copper connections for the final power output. Almost all of these materials currently have viable recycling methods and programs.[15] However, there are no known solar panel recycling facilities in Mongolia. Therefore, it will be a contractual requirement that faulty or waste PV panels will be collected, transported and recycled in an appropriate facility in the region by the PV panel suppliers. As Mongolia joined “The Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes” in 1996, this will require appropriate approvals and permits from the MoET. The suppliers will also periodically perform check on the PV panels for replacement or repair.

313. Li-ion batteries in general are expected to last for approximately 10 to 12 years before replacement is required, though during operation some will fail earlier than that or be faulty. Li-ion batteries are classified by the US federal government as non-hazardous waste and are safe for disposal in the normal municipal waste stream.[16] While other types of batteries include toxic metals such as cadmium, the metals in lithium ion batteries - cobalt, copper, nickel and iron - are considered safe for landfills or incinerators. Nonetheless, the preferred option is recycling. As with solar PV panels, there are no known Li-Ion battery recycling facilities in Mongolia. Therefore, it will be a contractual requirement that faulty or waste Li-Ion batteries will be collected, transported and recycled in an appropriate facility in the region by the battery suppliers, including the existing battery bank at Altai Soum. As with solar panels, this will require appropriate approvals and permits from the MoET.

314. Domestic wastes produced at the subproject sites will be collected and disposed at an approved local waste disposal sites following national regulations.

5. Wastewater

315. Operation of the subproject solar farms will generate small amounts of wastewater from

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[15] http://hespv.ca/blog/pv-module-recycling-a-new-market-opportunity/
[16] Kate Krebs, National Recycling Coalition, in http://www.retrievtech.com/recycling/lithium-ion, 2017.

the cleaning of panels. Rainwater will be used, and as their will be no cleaning additives, the water will be nontoxic and will be discharged to the site drainage system. No additional mitigations are required.

316. There will be no need for sanitation facilities at the wind farm and solar sites, the facilities at the adjacent substations or towns can be utilized.

6. Shallow-ground Heat Loss

317. The heating season in Mongolia is rather long, and lasts approximately 8 months (from mid-September to mid-May). Some GSHP studies have indicated that soil temperatures around the GSHP can degrade over along heating season; in other words, GSHP for heating for 8 months has the potential to extract more heat from the ground than is returned to the ground in the summer.[17] To mitigate this risk the Project will install a solar collector to re-charge the ground loop by solar heating during the summer, which improves the efficiency of the GSHP and prolongs the geological age of the thermal well.

7. Noise and Vibration

318. Operation of the solar power and GSHP subprojects will not generate noise and is not expected to result in any noise impacts. Operation of the wind turbines does generate noise, both aerodynamic noise caused by blades passing through the air, and mechanical noise created by the operation of mechanical elements in the nacelle - the generator, gearbox and other parts of the drive-train. Aerodynamic noise is a function of many interacting factors including blade design, rotational speed, wind speed and inflow turbulence. Close to the turbine, the noise typically exhibits a swishing sound as the blades rotate, and a whirr sound from the drive-train and generator. However, as distance from the turbine increases, these effects are reduced. In addition, advances in turbine technology and design, such as direct drive which eliminates gearboxes, have resulted in reduced noise emissions in recent decades.

319. The WHO has not published guidelines regarding wind turbine noise, though they will be releasing environmental noise guidelines for the European region in the near future. In practice, turbines are usually located no closer than 200 to 300 meters from residential areas. At 300 m distance, a typical turbine will have a sound pressure level of 43 dB(A).[18] To put that in context, the average air conditioner can reach 50 dB(A) of noise, and most refrigerators run at around 40 dB(A). At 500 m away, that sound pressure level drops to 38 dB(A). In most places, background noise ranges from 40 to 45 dB(A), meaning that a turbine's noise would be lost amongst it and would have a negligible impact (**Figure 78**). In Ireland, a lower fixed limit of 45 dB(A) or a maximum increase of 5 dB(A) above background noise at nearby noise sensitive locations is generally considered appropriate to provide protection to wind energy development neighbors.[19]

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[17] Wu, W., Wang, B., You, T., Shi, W., & Li, Z. (2013). A potential solution for thermal imbalance of Shallow-ground heat pump systems in cold regions: Shallow-ground absorption heat pump. *Renewable Energy*. 59: 39-48.

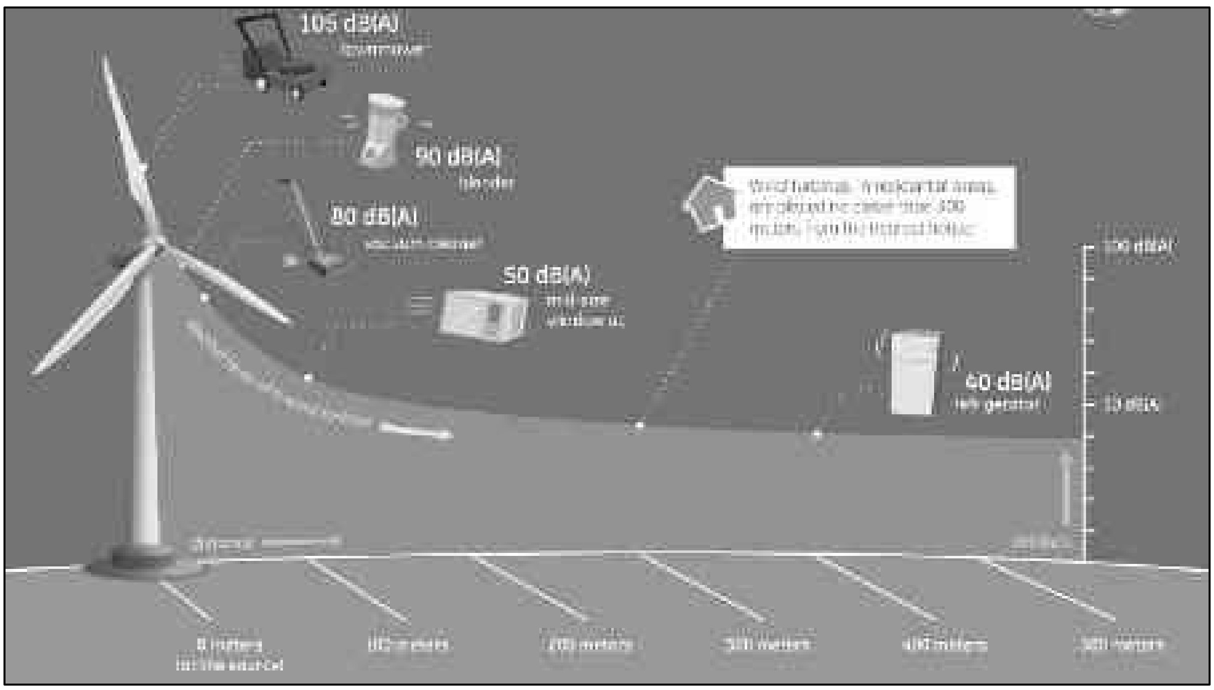
[18] An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20Hz-20 kHz) with A- frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. The decibel scale is logarithmic. A10 dB(A) increase in sound level represents a doubling of loudness. A change of 3 dB(A) is the minimum perceptible under normal circumstances.

[19] Wind Energy Development Guidelines - Department of Department of the Environment, Heritage and Local Government, Ireland.

320. Denmark was an early developer of wind turbine plants, and its noise code is more detailed than many countries. It requires a buffer zone of 4 times the total height of a wind turbine, so for a 50 m high turbine that is equivalent to a 200 m buffer, and a 100 m high turbine would require a 400 m buffer. For dwellings and summer cottages it also requires turbine noise levels at to be no more than 39 dB(A) (at wind speeds of 8 m/s) and 37 dB(A) (wind speeds of 6 m/s), and for dwellings in open country 44 dB(A) (wind speeds of 8 m/s) and 42 dB(A) (wind speeds of 6 m/s).

321. The 2.0 MW turbines in the Umnugovi subproject will be located more than 8 km from the nearest residence in Umnugovi town, and will have a predicted sound output ranging from 93 to 102 dB(A) (assuming Vestas V80-2.0 2.0 MW turbines). Given the attenuation of sound over distance, at 8 km there will be no sound impact from turbine operation at the nearest receptors (sound pressure will be less than background), and no mitigations are required. The subproject wind farm siting is also in full compliance with the setbacks required in the above mentioned codes and guidelines.

Figure 78: Wind turbine noise of CSP solar glare.



Source: https:/www.ge.com/reports/tag/ind, 2017.

322. The two 250 kW turbines in the Altai Soum subproject will be much smaller than in Umnugovi (only 40 to 50 m high towers, and only 12.5% of power output), and will have a predicted sound output ranging from 70 to 100 dB(A), depending on the manufacturer selected. The turbines will be located approximately 1.2 km from the nearest residence. Again, given the attenuation of sound over distance, at 1.2 km there will be no sound impact from turbine operation at the nearest receptors (sound pressure will be less than background), and no mitigations are required. The subproject farm siting is also in full compliance with the setbacks required in the above mentioned codes and guidelines.

323. In conclusion, both subproject windfarms are situated far enough from the nearest receptors that they will not cause negative noise impacts.

8. Aesthetic Impacts

324. There is a potential for wind farms, and to a lesser extent solar farms, to impact visual aesthetics negatively. With respect to wind farms, both farms are located sufficiently far from the inhabited areas that impacts should be minimal, and no other mitigation measures are required. It should also be noted that during the public consultations visual aesthetics was not raised as a potential issue by participants.

325. With respect to solar farms, their visual profile is much lower than wind turbines, and it is anticipated that their locations, which are also outside of the inhabited areas, will not have a negative impact. Again, it should also be noted that during the public consultations visual aesthetics was not raised as a potential issue by participants, including in Altai Soum where there is already an existing solar farm.

9. Shadow Flicker

Potential Impacts

326. Under certain combinations of geographical position, time of day and time of year, the sun may pass behind a wind turbine rotor and cast a shadow over neighboring properties. When the blades rotate, the shadow flicks on and off; the effect is known as "shadow flicker". It occurs only within buildings where the flicker appears through a narrow window opening. Shadow flicker effects may occur within a distance of up to ten rotor diameters of a wind turbine. At greater distances, the sun will be viewed behind the wind turbines, but shadow flicker effects are unlikely.[20] In addition, for shadow flicker to occur the turbine needs to be in a line in between the sun and the window; in northern latitudes this means that the turbine position needs to be between 130^{o} and 230^{o} from north relative to the affected building.

327. The Umnugovi subproject wind turbines will have a diameter of 80 m, so the potential zone of impact is 800 m from each turbine. The nearest residence is over 8 km from the site, so there will be no shadow flicker effect. The Altai Soum subproject wind turbines will have a diameter of 30 m, so the potential zone of impact is 300 m from each turbine. The nearest residence is approximately 1.2 km from the site, so again there will be no shadow flicker effect. Thus, no mitigation measures are required.

10. Bird and Bat Collisions (Solar PV and Wind Farms)

Potential Impacts

328. There is a potential for harm to birds due to the “lake effect” created by large areas of PV panels. Such installations may attract birds that mistake the solar panels for a water body, and the hot panels can kill or seriously injure birds which attempt to land on them. However, based on the site surveys and review of secondary data sources, there are no bird migratory routes in or near the subproject solar farm sites, and no reports of bird strikes on the existing Altai Soum solar

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[20] Scottish Government Online Renewables Planning Advice document “Onshore Wind Turbines”, 2011.

farm; thus, the impacts of subproject solar farms on birds are predicted to be very minor to non-existent.

329. Wind turbines can also cause bird fatalities. The closest protected areas to the Umnugovi subproject site are the Bassin d'Ubs Nuur World Heritage Site, 45 km to the northwest of the site; Khan Khukhii-Khyragas Lake National Park, 73 km to the east; and the Altan Khukhii Nature Reserve, 15 km to the southwest. The site is almost 90 km to the north of Khar Us Lake, which is a Ramsar site. The site is also located 11.5 km southwest of Uvsiin Khar Us Lake, which is far enough away as to have no impact on waterfowl. In addition, reports from the soum Governor and State Environmental Inspectorate have confirmed that the lake is saline and turbid, and does not provide habitat supporting migratory or resident waterfowl or other birds (**Appendix VII**). This further confirms that the subproject turbines are not expected to have any impact on bird species that might utilize those areas for nesting or habitat. In addition the site is not near cliffs or sloping hills where raptors could use an updraft to soar.

330. There are no known bird breeding, nesting or migratory routes at the Altai Soum wind farm site, and the two small turbines are not expected to pose a risk to birds.

Mitigation Measures

331. The Umnugovi wind farm has been sited 11.5 km away from Uvsiin Khar Us Lake. In addition, monitoring of bird and bat fatalities (if any) will be undertaken during the operation phase of the Umnugovi and Altai Soum subprojects, and if necessary operational changes will be implemented such as curtailment or night lighting. The nature of the operational change will depend on the nature of the recorded fatalities. For example, experience shows that bat fatalities can be significantly reduced by raising turbine cut in speed, defined as the lowest wind speed at which turbines generate power to the utility system, during periods when bats are active, with marginal annual power loss (less than 1% of total annual output).[21] If migratory bird fatalities are recorded, turbine operation can be curtailed during active migratory periods and times. In order to develop appropriate curtailment strategies the operators will consult with the local power company, PMU environmental safeguard staff and relevant specialists such as the Mongolian Wildlife Science and Conservation Centre, and ADB.

11. Bird Electrocutions on Distribution Lines

Potential Impacts

332. Raptors are opportunistic and in open Mongolian grasslands habitats where few natural perches exist, raptors are attracted to power poles, which provide roosting and nesting sites as well as hunting perches. However, utility structures can also pose a threat to raptors and other birds through electrocutions or collisions. Electrocution can occur when a bird completes an electric circuit by simultaneously touching two energized parts or an energized part and a grounded part of the electrical equipment. Collisions often occur with the overhead static wire, which may be less visible than the other wires due to its smaller diameter.

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[21] Edward B Arnett, Manuela MP Huso, Michael R Schirmacher, John P Hayes. *Altering turbine speed reduces bat mortality at wind energy facilities*. Ecological Society of America Research Communication. November 2010.

Mitigation Measures

333. The Project is only building a few relatively short distribution overhead power lines (OPLs): a 6.7 km long 35 kV OPL for the Umnugovi subproject; a 3 km 35 kV OPL for the Uliastai subproject; and a 150 m 35 kV OPL for the Govi Altai subproject. Such distribution lines are common throughout Mongolia.

334. The Project distribution OPLs will feature bird friendly designs developed in consultation with the Mongolian Wildlife Science and Conservation Centre and the relevant local power company. Technical advice will also be sought from leading avian powerline interaction experts, such as guidelines produced by the Avian Power Line Interaction Committee (APLIC).[22] Bird friendly design could include ensuring a safe distance between energized wires or between energized and grounded parts; designing crossarms, insulators and other parts of powerlines such that that birds find no opportunity to perch near energized power lines that might be hazardous; and, the use of marker balls, bird diverters, or other devices to increase line visibility.

12. Occupational Health and Safety

Potential Impacts

335. Workers may work at height or come in contact with high-voltage power lines/equipment during operation, maintenance and repair. Other hazards include lightening, fires, and accidents.

Mitigation Measures

336. These risks can be mitigated through the implementation of good operational OHS practices, as per the general *EHS Guidelines,* the *EHS Guidelines for Wind Energy,* and the *EHS Guidelines for Geothermal Power Generation.*

13. Community Health and Safety

Potential Impacts

337. Operational community health and safety impacts are low, and include exposure to electrical shocks if entering the solar farms, the risks of climbing wind turbine towers, and the potential for blade and ice throw. A failure in the rotor blade or ice accretion can result in the 'throwing' of a rotor blade or ice from the wind turbine,[23] which may affect public safety, although the risk of ice throw is only relevant to cold climates and the overall risk of blade throw is extremely low.

338. The increase in local traffic caused by subproject operation and maintenance will be insignificant, and there will be no air and insignificant effluent emissions.

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[22] APLIC was formed in 1989 to address whooping crane collisions with power lines. Since its inception, APLIC has expanded to address a variety of avian/power line interactions including electrocutions, collisions, and nests. PLIC members include over 50 electric utilities in the United States and Canada as well as the Edison Electric Institute, National Rural Electrical Cooperative Association, Rural Utilities Service, and U.S. Fish and Wildlife Service.

[23] The risk of being hit by turbine parts or ice fragments within a distance of 210 m is 1:10,000,000. (Taylor and Rand, 1991).

Mitigation Measures

339. These risks can be mitigated through the implementation of good community health and safety practices, as per the general *EHS Guidelines,* the *EHS Guidelines for Wind Energy,* and the *EHS Guidelines for Geothermal Power Generation.* Specifically, the solar farms will be fenced and public access prohibited, and turbine towers will be equipped with safety warning signs in Mongolian and anti-climbing devices.

340. With respect to ice and blade throw, the *EHS Guidelines for Wind Energy* recommend a safety setback for buildings and populated areas of up to 300 m. The Project turbines are in isolated locations, and the closest residences or buildings far exceed this recommended safety setback; thus, no further mitigations are required.

14. Climate Change

Potential Impacts

341. A separate Climate Risk Vulnerability Assessment (CRVA) was undertaken. The assessment was conducted by analyzing baseline climate data, historical climate trends, and projected climate trends for each of the subproject areas; assessing the projected climate change risks for each subproject; and, based on these analyses, recommending adaptation measures.

342. The primary source of climatological data was the Mongolian National Agency for Meteorology and Environment Monitoring (NAMEM). Data obtained for each subproject area for the period 1960-2015 included monthly (average, maximum, and minimum) and annual air temperatures in Celsius (^{o}C), precipitation in mm, and wind velocity in m/s. Linear regression were used to analyze long term observed climate data to determine climate trends.

343. To assess the potential climate trends over the Project areas the results of the most recent climate modelling projections presented in the Mongolian Third National Communication (NC3) were used. NC3 utilizes the results of a regional climate model (RegCM4) nested within two general circulation models (GCMs), ECHAM5 and HadGEM2, to predict future changes in temperature and precipitation in Mongolia. The two models were selected because they more accurately simulate current climate conditions than other available GCMs. Outputs from the two GCMs were downscaled by regional climate model RegCM4 using the AR5 Scenario Database to predict future changes in temperature and precipitation.

Findings and Mitigation Measures

344. Given the location in a land locked arid region, the Project is not threatened by some of the most serious effects of climate change such as sea level rise and coastal flooding. The observed and projected climate changes that do affect it do not appear to pose a serious or viability threatening risk to any of the three main types of RE technologies to be adopted (solar PV power, wind turbine power and GSHP heating). However, increased temperatures may lead to reduced PV efficiency, and extreme weather events such as high winds may pose a risk to both PV and turbine structures and associated infrastructure, and may also increase dust related issues and the need for increased maintenance. Flash flooding also poses a risk. The impact of these risks is generally low, and suitable adaptations have already been incorporated into the Project design.

345. For wind subprojects, these include:

- the selection of turbines with a lower cut-in wind speed (less than 3.0 m/s), if available, to help address the observed trend in some locations of declining minimum wind speeds;
- supporting infrastructure such as power lines designed to survive future projected extreme wind speed events; and
- flood dykes and site drainage to be installed to protect sites from flash flooding.

346. For solar subprojects, these include:

- design parameter for all Project solar array supports be increased to a range of -45 to +40 °C;
- heat resistant materials and products to be used where available;
- solar arrays designed to withstand future projected extreme wind speed events;
- solar arrays monitored for dust accumulation, and cleaned on a regular and as necessary basis; and
- flood dykes and site drainage to be installed to protect sites from flash flooding.

347. For GSHP subprojects:

- it is recommended that a solar collector be used to re-charge the ground loop by solar heating during the summer, which will improve the efficiency of the GSHP and prolong the geological age of the thermal well.

348. Overall, with the adoption of these measures, the Project is anticipated to be able to effectively withstand observed and projected climate charges.

E. Project Decommissioning

Potential Impacts

349. The subproject lifespans are expected to be 25+ years, at which point it is expected that they will be decommissioned. Typical activities during the decommissioning and site reclamation phase include facility removal, breaking up of concrete pads and foundations, removal of access roads that are not maintained for other uses, re-contouring the surface (if required), and revegetation. Associated impacts include erosion, noise, dust and vehicle exhaust, and the need to properly manage large amounts of debris, solar panels, wire and cabling, electronics, etc.

Mitigations – Decommissioning Plan

350. It is not possible to develop detailed decommissioning plans for events 25+ years in the future. However, at a minimum of 6 months prior to closure a decommissioning and site reclamation plan will be developed for each subproject that addresses effectively potential impacts, and is in accordance with good international practices and relevant government regulations and standards in force at that time.

F. Project Benefits

1. Increased RE Capacity and Increased Access to Energy Via RE

351. The Project aims to upscale distributed RE systems in remote and less developed regions where private sector developers have been unwilling to invest. It is a first of its kind renewable

energy system development with variety of renewable energy technologies ensuring grid stability and providing clean electricity and heat to the demand in geographically scattered load centers.

352. The Project will install an aggregate RE capacity of 41 MW, consisting of 40.5 MW capacity from distributed renewable energy systems in Western and Altai-Uliastai regions and 0.5 kW of Shallow-ground heat pumps in public buildings in selected five townships of the targeted region. The aggregate capacity is expected to generate 98.77 gigawatt-hour (GWh) annually.

353. The proposed investment will increase Mongolia's installed RE capacity by more than 47% above 2017 levels. The Project is an important step in demonstrating the viability of solar, wind, energy storage, and Shallow-ground heating in remote areas which are currently unattractive to private sector developers. It will provide a "blueprint" for commercial deployment of distributed RE at the MW scale in remote areas, where the bulk of Mongolia's renewable resources are located. The successful implementation of the Project will encourage more investments in RE projects, which will contribute to meeting Mongolia's growing energy demand. In addition, it will demonstrate performance of Shallow-ground heat pump systems and increase experience in design, installation, operation and maintenance for future scaling-up. It is also expected to contribute to the knowledge and insight of the government to formulate appropriate policy incentives to ramp up new investments in clean energy.

2. Project Beneficiaries

354. The Project will benefit an estimated 71,828 households[24] or 258,313 individuals (139,353 male and 118,960 female). This will result in approximately 50% of the local population in the targeted regions having access to clean energy (see **Table 46**).

355. Clean and affordable electricity will benefit the local population in terms of lower energy costs, public health benefits, and improved energy security. It will facilitate improved social service delivery at public health facilities and schools. Improved quality of electricity will also facilitate access to modern appliances and communications.

[24] Assumes average consumption of 1,579 kWh / household in WES and 1,204 kWh / household in AuES

Table 46: Subproject target capacity and beneficiaries (core and non-core).

Subprojects	Capacity (MW)	Annual Power Generation (MWh)	Household beneficiaries	Individual beneficiaries
Component 1: Distributed RE System Development				
Umnugovi Wind Power	10.0	34,038.1	21,557	83,859
Altai Solar PV	10.0	17,147.4	14,246	49,092
Altai Soum Solar PV/Wind hybrid and battery storage	0.5	1,148.5	246	28,702
Uliastai Solar PV and battery storage	5.0	10,025.2	8,329	48,022
Telmen Wind Power	5.0	16,773.4	13,935	46,573
Moron Solar PV	10.0	16,267.2	13,515	1,230
Component 2: Shallow-ground Heat Pumps				
Aimag Capitals	0.5	3,369.6		835
Total	**41.0**	**98,769.4**	**71,828**	**258,313**

MWh = megawatt-hour, PV = photovoltaic, RE = renewable energy.

3. Supporting Low Emissions Targets

356. The Project will help Mongolia meet its Intended Nationally Determined Contributions (INDC) under the Paris climate accord. The Government of Mongolia (GoM) plans to increase renewable energy to 20% of installed capacity by 2023 and 30% by 2030, versus 7.5% of total capacity in 2016. To meet these targets, renewable capacity needs to be expanded to 633 MW in 2023 and 1,085 MW in 2030 from 110 MW expected by year-end 2017.

357. The Project will be an important part of this process, and will help decarbonize the country's energy sector by increasing the share of renewable energy in the energy mix. Coal-fired power accounts 91% of Mongolia's total generation capacity and 95% of total energy generation making the energy sector a major greenhouse gas emitter.

4. Reduced Emissions

358. The implementation of the Project will avoid air pollution associated with coal and diesel use for power generation and space heating. Project operation will reduce electricity imports from the Siberian Grid by 94.3 GWh per year; reduce petroleum consumption in electricity generation by 795,080 liters per year in the Altai Soum subproject area; and avoid 1,114 tons per year of coal use for space heating. GHG emission savings from project operation are estimated at 87,969 tons CO_2e per year or 2.2 million tons CO_2e over the project's 25 years lifetime. Reduced pollutant emissions are estimated at 306 tons of SO_2 annually (7,655 tons over the project lifetime), 385 tons of NOx annually (9,630 tons over the project lifetime), 59 tons of PM_{10} (1,482 tons over the project lifetime), and 49 tons of $PM_{2.5}$ (1,235 tons over the project lifetime) (see **Table 47**).

359. The Shallow-ground heating subproject will supply air pollutant-free space heating for 10,000 m^2 of floor area in total. Due to harsh and long winters, space heating is one of the critical issues with direct influence on living standards. Decentralized, coal based individual heating systems are common in the targeted regions while electric heating is also becoming popular. The subproject will demonstrate performance and enable to gain experience in design, installation, operation and maintenance of a Shallow-ground heat pump systems for future scaling-up.

Table 47: Estimated Project emission savings (core and non-core subprojects).

Subprojects	Capacity (MW)	Annual Power Generation (MWh)	Annual GHG emission savings (t CO_{2e})	Lifetime GHG emission savings (t CO_{2e})	Annual SO_2 emission savings (t)	Lifetime SO_2 emission savings (t)	Annual NOx emission savings (t)	Lifetime NOx emission savings (t)	Annual PM_{10} emission savings (t)	Lifetime PM_{10} emission savings (t)	Annual $PM_{2.5}$ emission savings (t)	Lifetime $PM_{2.5}$ emission savings (t)
Component 1: Distributed RE System												
Umnugovi Wind Power	10.0	34,038	30,396	759,900	106	2,638	133	3,319	20	511	17	425
Altai Solar PV	10.0	17,147	15,313	382,816	53	1,329	67	1,672	10	257	9	214
Altai Soum Solar PV/Wind Hybrid	0.5	1,149	827	20,672	4	89	4	112	1	17	1	14
Uliastai Solar PV + battery	5.0	10,025	8,953	223,813	31	777	39	977	6	150	5	125
Telmen Wind Power	5.0	16,773	14,979	374,466	52	1,300	65	1,635	10	252	8	210
Moron Solar PV	10.0	16,267	14,527	363,166	50	1,261	63	1,586	10	244	8	203
Component 2: GSHP												
GSHPs	0.5	3,370	2,976	74,388	10	261	13	329	2	51	2	42
Total	**41.0**	**98,769**	**87,969**	**2,199,221**	**306**	**7,655**	**385**	**9,630**	**59**	**1,482**	**49**	**1,235**

MW = megawatt, MWh = megawatt-hour, PV = photovoltaic, RE = renewable energy, tCO_{2e} = tons of carbon dioxide equivalent, SO_2 = Sulfur Dioxide, NO_x = Nitrogen Oxides, PM_{10} = Particulate Matter smaller than 10 micrometers, $PM_{2.5}$ = Particulate Matter smaller than 2.5 micrometers.

Emission Factors	Source
CO_2 - 0.8930 tons CO_{2e} per MWh	Siberian grid emission factor (0.893 tons CO_{2e} per MWh), *Development of Electricity Carbon Emission Factors for Russia*, Lahmeyer, Oct 2010.
SO_2 - .0031 tons SO_2 per MWh NOx - .0039 tons NOx per MWh PM_{10} - .0006 tons PM_{10} per MWh $PM_{2.5}$ - .0004 tons $PM_{2.5}$ per MWh	Wei Peng et al, *Air quality and climate benefits of long-distance electricity transmission in China*, Environ. Res. Lett. 12 (2017). Emission factors based on small coal power plants over six provinces (Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang and Guangdong)

5. Affordability and Competitiveness of RE

360. To address the challenges in remote grid systems, the GOM has identified solar and wind based distributed RE systems as optimum energy service solutions. These systems are inherently modular and scalable, and deliver clean energy as close to load centers as possible, minimizing the need for imported electricity while reducing fossil fuel consumption and transmission losses.

361. The RE potential (geothermal, hydro, solar, and wind) in Mongolia is estimated to be 2,600 GW; the solar potential alone is estimated at 1,500 GW, with potential energy output of 4,774,000 GW-hours per year (GWh/y). Assuming only 1% of solar – 15 GW -- becomes economically viable, the scale-up and replication potential is 12.9 times the existing total installed generation capacity, and 1,500 times currently installed utility-scale solar capacity. On an energy output basis, commercializing only 1% of solar potential – 47,740 GWh/y – the scale up and replication potential is 8.23 times 2016 total electricity output.

362. As the capital costs of solar and wind systems continue to decline, the economically viable resources in Mongolia will increase. As experience is gained and risk profiles for new projects are reduced, the off-take prices required for financial viability will decrease, resulting in a cycle which will accelerate renewable energy development. Based on global trends, off-take prices for utility-scale solar and wind in Mongolia can be expected to reach grid parity in the foreseeable future. Cost trends for energy storage are also declining rapidly, and within another five years the combined costs of solar, wind and batteries should result in dispatchable energy at grid parity.

363. However, renewable resources remain largely untapped in Mongolia, mainly because renewable energy system must compete with coal which has a levelized cost of around $0.07 per kilowatt-hour (kWh). This benchmark energy cost is being achieved on solar and wind power projects in other developing countries, but driving down the costs of solar, wind, and renewable energy based heating services in the country will require near-term concessional financing and evolution of energy policies and pricing frameworks to facilitate growth of renewable energy.

364. The Project will be instrumental in driving down the cost of electricity in the targeted regions and will help RE sources to achieve grid parity. Establishing this levelized cost benchmark is needed to catalyze deployment of renewable energy in remote and less developed areas while also reducing the cost of energy services to end-user.

6. Economic and Social Development

365. The project will contribute to social and economic development. The project locations are in the remote and sparsely populated Western and Altai-Uliastai regions in the western part of Mongolia, composed of six aimags: Uvs, Hovd, Bayan-Olgii, Khovsgol, Zhavkhan, and Govi- Altai. These aimags are less developed with respect to educational attainment, life expectancy, and monetary income. Average Human Development Index (HDI) in these regions is around 0.657 compared to national average and Ulaanbaatar HDIs of 0.735 and 0.812 respectively. The regional disparity in HDI is correlated strongly to electricity consumption per capita: 381 kWh per month of average electricity consumption per capita in these regions against a national average of 1,776 kWh and 1,536 kWh in Ulaanbaatar.

366. The Project will bring economic benefits in terms of substituting imported electricity from Siberian grid in Russia; benefits are estimated at $7.5 million per year. In 2016, electricity imports into Mongolia represented 19.9% of total consumption. The foreign exchange savings from avoided electricity imports can be redirected to other economic and social development activities

in these regions.

VI. ALTERNATIVE ANALYSIS

367. An analysis of project alternatives was undertaken during the feasibility stage to determine the most financially and technically feasible way of achieving the Project objectives including wind strength, permafrost and site elevation, etc. while minimizing environmental and social impacts and maximizing environmental and social benefits.

A. Umnugovi 10 MW Wind Power

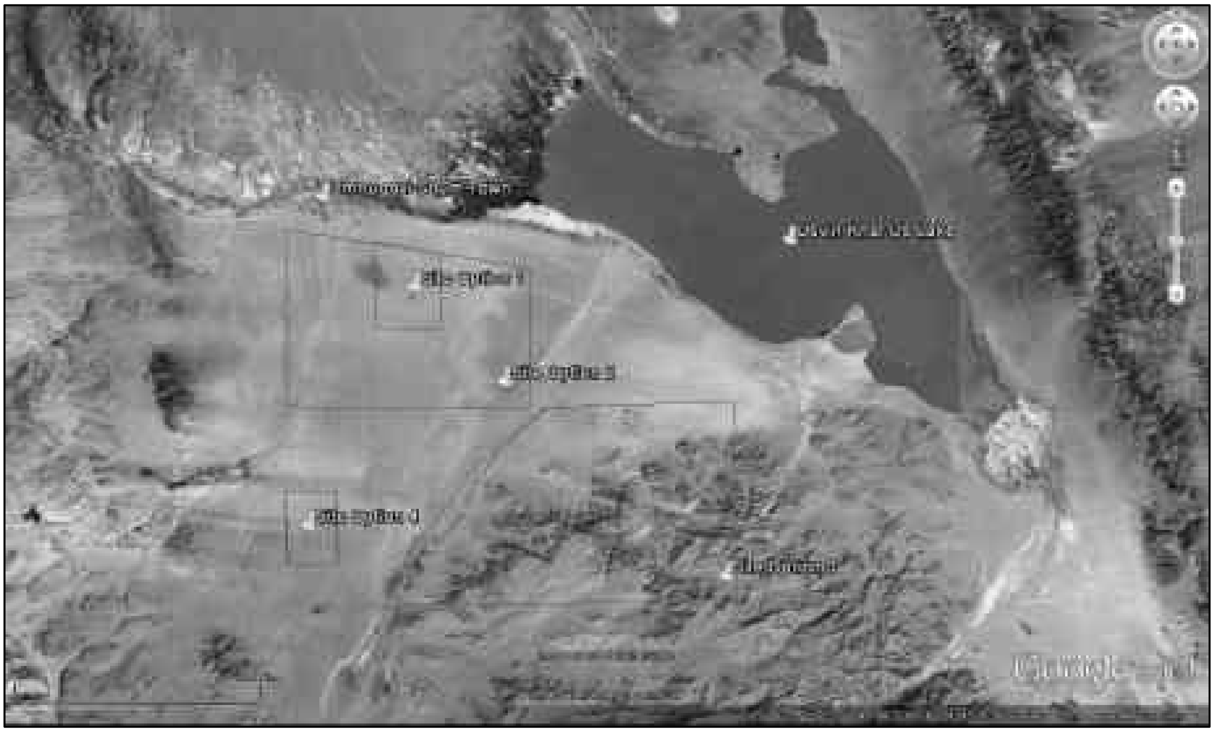
1. Siting Options

368. Based on meso-scale analysis, four site options were considered for the wind farm. The final selection of site option 4 was based on an analysis of the trade-off between yield and grid connection and other costs, wind strength, permafrost, and a precautionary approach which adopted a large 11.5 km buffer between the wind farm and Uvsiin Khar Us Lake, while avoiding hilly areas which could also be good raptor habitat (**Figure 79**).

2. Technology Selection

369. To increase the overall availability and flexibility of power generation, it was initially recommended to avoid the installation of large capacity wind turbines, e.g. instead of four 2.5 MW turbines, it was suggested to install several smaller units ranging from 500 kW to 1.8 MW. However, in this size range the number of manufacturers is quite limited, and based on an assessment of market availability and current international standard practice, it was decided to utilize 5 two MW wind turbines which will be sourced internationally.

Figure 79: Umnugovi subproject site options. Option 4 was selected.



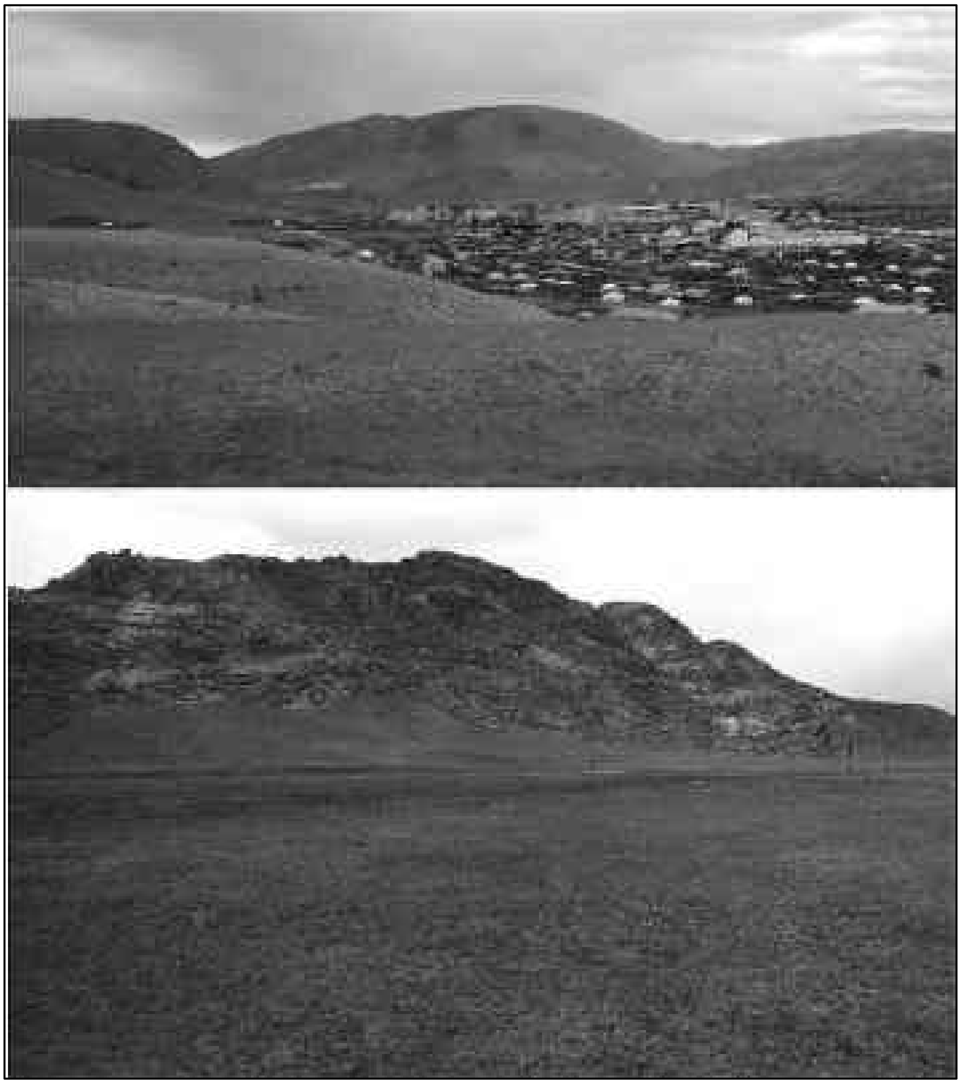
Source: ADB PPTA consultants and Google Earth 2017.

B. Uliastai 5 MW Solar PV with Battery Storage

1. Siting Options

370. Three sites were considered – the selected site, a site at Taishir (a village 50 km NNE of Altai Gobi and site of a 11 MW hydro-power plant) and one on the western outskirts of Uliastai. However the Taishir site was considered to be too far from the place of consumption and would lead to line losses and poor service, and the site on the western outskirts of Uliastai (**Figure 80**) was inspected and found to be reserved for winter yurts, and thus not socially acceptable.

Figure 80: Rejected Uliastai PV site, looking SE towards Uliastai (top) and NW (bottom).



Source: ADB PPTA consultants.

2. Technology Options

371. Solar PV modules (panels) as the driving force of photovoltaic PV generation to convert light into electric current. PV solar technology generates power because substances like silicon generate an electrical current when they absorb sunlight, in a process known as the photovoltaic effect. Solar PV technologies include monocrystalline silicon, polycrystalline silicon and thin-film.

372. Monocrystalline solar is made by growing a single crystal. Because these crystals are usually an oval shape, monocrystalline panels are cut into the distinctive patterns that give them their recognizable appearance: the sliced silicon cells expose the missing corners in the grid-like structure. The crystal framework in a monocrystalline is even, producing a steady blue color and no grain marks, giving it the best purity and highest efficiency levels. But costs for monocrystalline silicon solar PV is higher than other options.

373. Polycrystalline solar is made by pouring molten silicon into a cast. However, because of

this construction method, the crystal structure will form imperfectly, creating boundaries where the crystal formation breaks. This gives the polycrystalline silicon its distinctive, grainy appearance, as the gemstone type pattern highlights the boundaries in the crystal. Because of these impurities in the crystal, polycrystalline silicon is less efficient when compared with monocrystalline. However, this manufacturing process uses less energy and materials, giving it a significant cost advantage over monocrystalline silicon.

374. The technology with the lowest market share is thin-film, but while it has several disadvantages, it is a good option for projects with lesser power requirements and a need for light weight and portability. Thin-film panels can be constructed from a variety of materials, with the main options being amorphous silicon (a-Si), the most prevalent type; cadmium telluride (CdTe); and, copper indium gallium selenide (CIS/CIGS).

375. Generally, monocrystalline silicon solar PV is the best technology to deliver efficiency, as measured by wattage output related to the panel's size[25], and this technology was selected to be used in the subproject solar farms.

376. In terms of battery technology, the most common battery chemistry is that of Lithium-Ion (Li-Ion) followed closely by NaS (Sodium Sulphur). Other options include Vanadium Redox batteries (VRB) and Vanadium flow batteries, and Zinc Bromine (ZnBr) batteries. The subproject will select the battery type during detail design stage based on a current international use and market availability, cost, performance and environmental impact including ability to recycle the batteries.

C. Govi Altai 10 MW Solar PV

1. Siting Options

377. The proposed location, a 20 ha site along the paved road from Khovd, north of the Altai Airport, and 1.5 km from the edge of Altai City, in Jargalant Bahg, was considered suitable, and no other options were considered.

2. Technology Options

378. Please refer to the Uliastai discussion on solar PV modules, above.

D. Altai Soum Hybrid Solar and Wind

1. Siting Options

379. Two site options were considered for the wind farm site (**Figure 81**). Both were suitable, but option 1 was selected due to proximity to the existing solar farm.

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[25] www.solarpowerworldonline.com, 2015.

Figure 81: Altai Soum subproject wind farm site options. Option 1 was selected.

Source: ADB PPTA consultants and Google Earth 2017.

2. Technology Options

380. The subproject will improve the standard of electricity supply provision to Altai Soum by rehabilitating the existing 200 kW solar station battery facilities, and adding new wind power generation facilities. This approach will render the use of diesel generators only for emergency conditions.

381. Two wind supply options were considered: a 250 kW wind farm, and a 500 kW wind farm. Based on the solar profile at the site, annual wind patterns, equipment costs, energy demand and levelized cost of energy per kWh, the 250 kW wind farm option was selected.

E. Khovd Shallow-ground Heat Pump

1. Siting Options

382. Kindergarten 1 is one of eleven sites that were examined in Khovd as part of a GSHP study:

- Kindergarten No. 10
- School No. 7
- Tax Department
- Weather and Environment Monitoring Office
- Prosecutor Office
- Committee for Senior Citizens
- Kindergarten No. 8
- Kindergarten No. 1

- Criminal investigation of the Court
- Police Office
- Family Healthcare Center Bugat

383. A shortlist of five was selected based on factors including the building owner's land available for installation; insulation and weatherization undertaken; age and condition of buildings indicating a life expectancy of more than 10 years; and amount of coal burned for heating. Kindergarten 1, under construction during the appraisal process, was selected due to its high energy efficiency with insulation and sealed windows. This building will become a pilot site for GSHPs, and will inform the case for installing GSHPs at other Aimag capitals in phase two.

Figure 82: Shortlisted sites for Khovd Shallow-ground Heat Pump pilot subproject. Kindergarten No. 1 was selected.

Source: ADB PPTA consultants and Google Earth 2017.

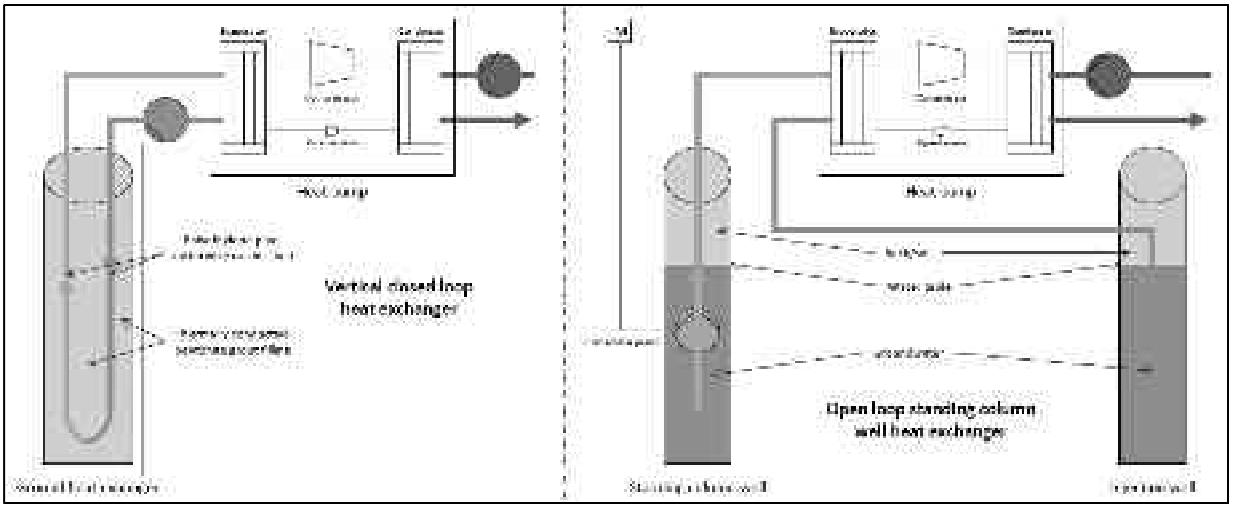
2. Technology Options

384. The US Environmental Protection Agency (EPA) has called GSHPs the most energy-efficient, environmentally clean, and cost-effective space conditioning systems available. Shallow-ground heat pumps offer significantly lower emissions than other heating and cooling

options because they move the earth’s thermal energy from one place to another without burning fossil fuels or emitting carbon monoxide, carbon dioxide or other greenhouse gases.

385. Shallow-ground heat exchangers can be divided into shallow (1.0–2.5 m) horizontal heat exchangers and deep (15–150 m) vertical systems. Deep vertical systems are divided into closed loop systems, which use a mixture of anti-freeze (e.g. propylene glycol) and water as a heating media, and open loop systems which use natural groundwater as a heating media (**Figure 83**).

Figure 83: Closed and open loop heat exchangers.



Source: ADB PPTA consultants.

386. A PPTA GSHP study determined that the preferred ground heat exchanger type in Khovd is the deep vertical system, as the ground freezing level in Khovd is deeper than 3.2 meters, beyond the typical installation depth of horizontal heat exchangers. The system will be closed, as test wells did not encounter sufficient groundwater resources to allow for an open system. In addition, the depth of overburden (36 to 51 m) before encountering bedrock means that the cost of casing to seal off the overburden would be significant.

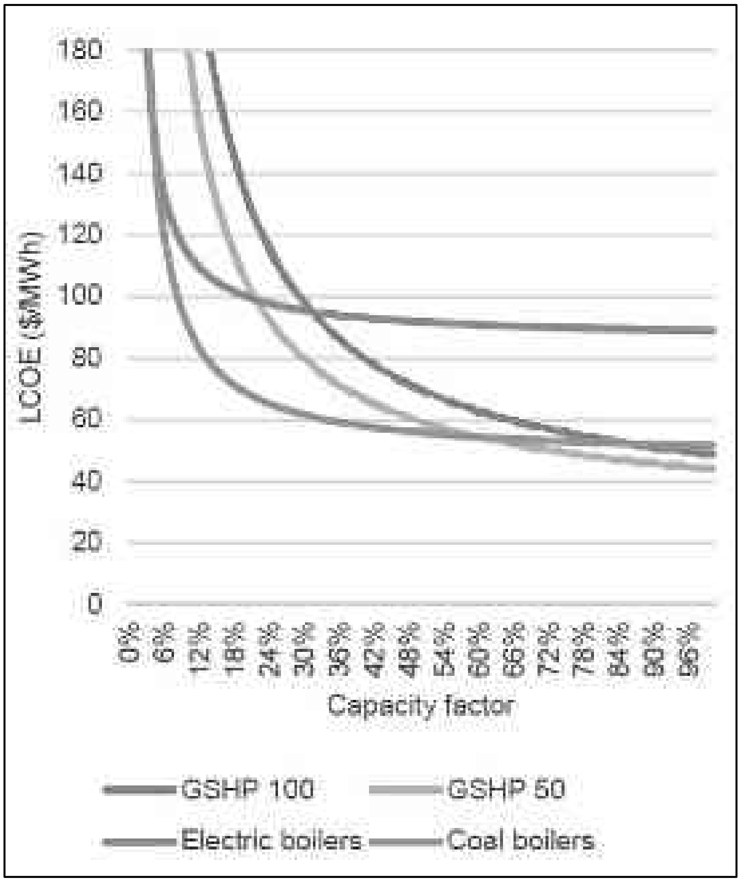
387. Vertical systems cost more than horizontal systems but they bring significant advantages, including more stable underground temperatures, better conductivity in what is likely to be rock, and a smaller "footprint" than horizontal loop fields.

388. With regards to the peak boiler, two options were considered, electric and coal. A Levelized Cost of Energy (LCoE) analysis was conducted for each technology option. The LCoE calculation is based on calculating the discounted present value of annual cash flows and the amounts of annual heat production and deriving the levelized cost of heat per unit($/MWh). It accounts for all capital and operating costs, including fuels. Compared to direct cost calculation, the LCoE method accounts energy costs over an entire project period including the financing costs. It thus provides a reasonable basis on which to prioritize technology options.

389. The results of the LCoE analysis are shown in **Figure 84**. The analysis indicates that from an economic consideration the optimal capacity mix is GSHPs as a base load and coal boilers as a peak and reserve capacity, as economic LCoE curves of the GSHPs break the coal boiler curve

at the capacity factors between 60 to 86%.

Figure 84: LCoE analysis for various heating technologies.



Note: GSHP 50 = 50 m bore depth. GSHP 100 = 100 m bore depth.
Source: PPTA consultant, 2017.

390. It should be noted that the GSHP has been has been dimensioned to be relatively large (132 kW, 51% of the peak demand) thereby minimizing the need for the peak boiler. It is estimated that the peak boiler will only be needed for a maximum of 15 days per year, when the temperature is below -30 °C.

F. No Project Alternative

391. The "no project" alternative addresses the likely consequences of not undertaking the proposed action. The Project is expected to result in significant environmental and social benefits as described in Chapter V. Based on the important of the anticipated Project benefits, the "no project" alternative was rejected.

G. Overall Alternative Analysis

392. Based on the analysis of alternatives, the Project has selected the most appropriate subproject locations and technologies.

VII. INFORMATION DISCLOSURE AND PUBLIC CONSULTATION

A. Mongolian and ADB Requirements for Public Consultation

1. Mongolian Requirements

393. Mongolian public consultation requirements are related to the DEIA process, described in Chapter II of this report. The *Law on Environmental Impact Assessment* (2012) requires that:

- Development plans and programs assessed as part of the DEIA process will be publicly disclosed on the website of the State Administrative Central Organization in charge of nature and environment.

- There will be a 30 working day period for submittal of verbal or written public input, and the DEIA consultant should organize community consultations that include local government and local residents within the area of influence.

- The DEIA should include meeting minutes, comments by local government, and community consultation that has been conducted with local communities in the area of influence.[26]

2. ADB Requirements

394. ADB's SPS 2009 has specific requirements for information disclosure and public consultation.

395. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders, beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project. In order to make key documents widely available to the general public, the SPS 2009 requires submission of a final IEE for Category B projects, to ADB for posting on the ADB website. The SPS 2009 requires that borrowers take a proactive disclosure approach and provide relevant information from environmental assessment documentation directly to affected peoples and stakeholders.

396. The SPS 2009 also requires that the borrower carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation in project decision making.

B. ADB Stakeholder Consultations

397. The proposed project was initially identified by the Ministry of Energy (MoE). During the project design stage, the MOE and ADB carried out several meaningful consultations with the National Dispatching Center, the WES State-Owned Joint Stock Company (SOJSC), the AuES SOJSC and local communities, to firm up subproject designs and to carry out the project feasibility

[26] *Law on Environmental Impact Assessment* (2012), Articles 8 and 18.

studies.

398. In addition to those mentioned above, stakeholders include local government officials and other public agencies, the private sector, local residents (with focus on women and vulnerable groups), civil society organizations, schools and small business owners.

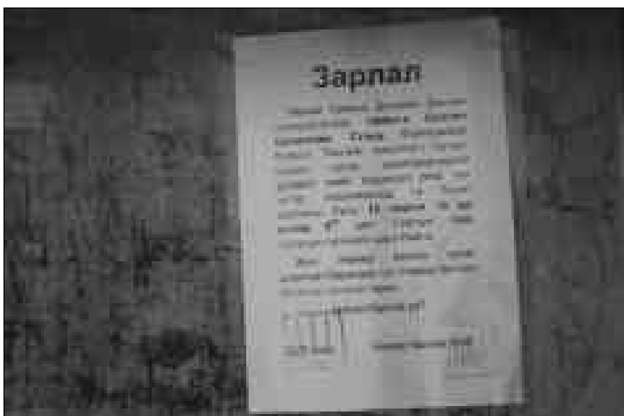
C. Public Consultation During DEIA Preparation

399. As part of the DEIA preparation public consultation meetings were held led by environmental specialists from MonEnergy (PPTA consultant) and Sunny Trade Co., Ltd LLC, the company selected to prepare the DEIA. The meetings were held from 16 to 21 October 2017 and March 2018, and introduced the Project’s goals and activities, discussed the EIA process and environmental issues, and received stakeholder’s opinions on the Project and the EIA. The environment team travelled a total of 3,200 km by car during the consultation process (not including flights taken in March 2018), and a total of 338 people attended the meetings.

1. Umnugovi 10 MW Wind

400. A public consultation meeting was held on October 18th, 2017 in Umnugovi Soum. The meeting was attended by a total of 120 stakeholders (**Appendix VIII**). Uvs Aimag Governor Batsaikhan D., Umnugovi Soum Governor Tumurchudur, and Namir Bahg Citizens Representative Hural Chairman Tserenpil also participated in the meeting and presented their opinions.

Figure 85: Public consultation meeting at Umnugovi Soum.



Public meeting announcement	Presentation on project and environmental assessment

	
Meeting participants.	Comment from a participant.

Source: PPTA consultant, 2017.

401. The meeting agenda is presented below:

i. Opening by Mr. Nurzed L., Chairman of Namir Bahg Citizens Representative Hural, Umnugovi Soum, Uvs Aimag.
ii. Introduction of Umnugovi 10 MW Wind subproject by Prof. Adiyasuren Ts., environmental expert of Mon Energy Consult Co. Ltd.
iii. Environmental impact assessment process and findings, by Mr. Togtokhnyam B., Manager of Sunny Trade Co. Ltd.; Mr. Utrnasan B., flora and soil expert of Sunny Trade Co. Ltd.; and Ms. Enktuya M., water expert of Sunny Trade Co. Ltd.
iv. Discussions.
v. Conclusion: Adopt Namir Bahg Peoples Citizens Representative Hural resolution.
vi. Closing.

402. No issues were raised during the consultation. The meeting participants welcomed and supported the proposed subproject. Members of the Namir Bahg Citizens Representative Hural expressed support for the subproject and the EIA. The meeting concluded with a decision to adopt a Namir Bahg Citizen Representative Hural resolution to support the subproject and the EIA, and to convey that support to the Ministry of Environment and Tourism (MoET). The resolution is presented in **Appendix VIII**.

2. Uliastai 5 MW Solar PV with Battery Storage

403. A public consultation meeting was held on March 7th, 2018, in Mandaat Bag, Aldarkhaan Soum, Zavkhan Aimag. The meeting was attended by a total of 101 stakeholders (**Appendix VIII**). Aldarkhaan Soum Governor Batdeger, the Head of the Altai Uliastai Energy Grid Mr. Badamkhatan, and Mandaat Bahg Citizens Representative Hural Chairman Ms. Tserenbyamba M. also participated in the meeting and presented their opinions.

404. The meeting agenda is presented below:

i. Opening by Ms. Tserenbyamba M., Chairman of Mandaat Bag Citizens Representative Hural, Aldarkhaan Soum, Zavkhan Aimag.
ii. Introduction of Uliastai 5 MW solar plus battery storage subproject by Prof. Adiyasuren Ts., environmental expert of Mon Energy Consult Co. Ltd.

iii. Environmental impact assessment process and findings, by Mr. Togtokhnyam B., Manager of Sunny Trade Co. Ltd.; Mr. Utrnasan B., flora and soil expert of Sunny Trade Co. Ltd.; and Ms. Enktuya M., water expert of Sunny Trade Co. Ltd.
iv. Discussions.
v. Conclusion: Adopt Mandaat Bahg Peoples Citizens Representative Hural resolution.
vi. Closing.

405. No issues were raised during the consultation. The meeting participants welcomed and supported the proposed subproject. Members of the Mandaat Bahg Citizens Representative Hural expressed support for the subproject and the EIA. The meeting concluded with a decision to adopt a Mandaat Bahg Citizen Representative Hural resolution to support the subproject and the EIA, and to convey that support to the Ministry of Environment and Tourism (MoET). The resolution is presented in **Appendix VIII**.

Figure 86: Public consultation meeting at Aldarkhaan Soum (Uliastai).

Presentation on project and environmental assessment

Question and answer period

Meeting participants.

Meeting participants.

Source: PPTA consultant, 2018.

406. A letter was written to the Donoi Airfield explaining the Project and mitigations to be adopted to prevent glare impacting the airport. However, the airfield was not under operation during the Project preparation period, and the letter could not be delivered. It is understood that the airport is only operated periodically.

3. Govi Altai 10 MW Solar PV

407. A public consultation meeting was held on October 16th, 2017 in Jargalant Bahg, Yesonbulag Soum. The meeting was attended by a total of 63 stakeholders (**Appendix VIII**). Altai-Uliastai Energy System (AuES) Director Purevsuren A., Vice Director Otgonbayar D., and relevant officials participated in the meeting and presented their opinions.

408. The meeting agenda is presented below:

i. Opening by Mr. Altantsog G., Chairman of Jargalant Bahg Citizens Representative Hural, Yesonbulag Soum, Govi-Altai Aimag.
ii. Introduction of Govi-Altai 10 MW solar PV subproject by Prof. Adiyasuren Ts., environmental expert of Mon Energy Consult Co. Ltd.
iii. Environmental impact assessment process and findings, by Mr. Togtokhnyam B., Manager of Sunny Trade Co. Ltd.; Mr. Utrnasan B., flora and soil expert of Sunny Trade Co. Ltd.; and Ms. Enktuya M., water expert of Sunny Trade Co. Ltd.
iv. Discussions.
v. Conclusion: Adopt Jargalant Bahg Peoples Citizens Representative Hural resolution.
vi. Closing.

Figure 87: Public consultation meeting at Yesonbulag Soum.

Project presentation.	Meeting participants.

Source: PPTA consultant, 2017.

409. No issues were raised during the consultation. The meeting participants expressed support for the proposed subproject. The meeting concluded with a decision to adopt a Jargalant Bahg Citizen Representative Hural resolution to support the project and the environmental impact assessment, and to convey that support to the MoET. The resolution is presented in **Appendix VIII**.

410. A letter was sent to the Altai Airport explaining the project and mitigations to be adopted to prevent glare impacting the airport. No response was received.

4. Altai Soum Hybrid System

411. Due to the small scale of the Altai Soum hybrid RE subproject, public consultation is not required under relevant Mongolian legislation. Nonetheless, meeting and consultations were held with the soum government, including Vice-Governor Mrs. Bayartsetseg and Head of Governor's office Mr. Batbayar; PV station management and personnel; and various soum inhabitants. No issues were raised. They all supported the proposed subproject.

5. Khovd Shallow-ground Heat Pump

412. A public consultation meeting was held on October 17th, 2017 in Takhilt Bahg, Jargalant Soum. The meeting was attended by a total of 54 stakeholders (**Appendix VIII**). The Kindergarten 1 Director and teachers also participated in the meeting and presented their opinions.

413. The meeting agenda is presented below:

i. Opening by Ms. Khorolsuren N. G., Chairman of Takhilt Bahg Citizens Representative Hural, Jargalant Soum, Khovd Aimag.
ii. Introduction of Govi Altai 10 MW solar PV subproject by Prof. Adiyasuren Ts., environmental expert of Mon Energy Consult Co. Ltd.
iii. Environmental impact assessment process and findings, by Mr. Togtokhnyam B., Manager of Sunny Trade Co. Ltd.; Mr. Utrnasan B., flora and soil expert of Sunny Trade Co. Ltd.; and Ms. Enktuya M., water expert of Sunny Trade Co. Ltd.
iv. Discussions.
v. Conclusion: Adopt Takhilt Bahg Peoples Citizens Representative Hural resolution.
vi. Closing.

414. No issues were raised during the consultation. The meeting participants expressed support for the proposed subproject. The meeting concluded with a decision to adopt a Takhilt Bahg Citizen Representative Hural resolution to support the project and the environmental impact assessment, and to convey that support to the MoET. The resolution is presented in **Appendix VIII**.

Figure 88: Public consultation meeting at Takhilt Soum.

Meeting participants.	Kindergarten 1 Director addresses the participants.

Source: PPTA consultant, 2017.

D. Future Disclosure and Consultation Activities

415. Stakeholder engagement will continue during construction and operation in accordance with relevant government and ADB policies and procedures.

416. Environmental monitoring reports will be disclosed on ADB's website semi-annually during construction and annually during operation.

417. The IAs will continue to conduct regular community liaison activities during the construction and operation phases, including the implementation of the grievance redress mechanism (**GRM**, see **Chapter VIII**). Ongoing consultation will ensure that public concerns are understood and dealt with in a timely manner.

VIII. GRIEVANCE REDRESS MECHANISM

A. Introduction

418. A project grievance is defined as an actual or perceived project related problem that gives ground for complaint by an affected person (AP). As a general policy, the EA will work proactively toward preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before they become grievances. In addition, as the Project has strong public support and will not involve any involuntary land or property acquisition or resettlement, significant grievance are unlikely. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues arise. In order to address complaints if or when they arise, a Project GRM will be developed in accordance with ADB requirements and Government practices. A GRM is a systematic process for receiving, recording, evaluating and addressing an AP's project-related grievances transparently and in a reasonable period of time.

B. ADB's GRM Requirements

419. The ADB SPS 2009 requires the EA and IAs to establish a GRM to receive and facilitate resolution of AP's concerns and complaints about the Project's environmental performance during the construction and operation phases. The GRM should i) be scaled to the risks and adverse impacts of the project; ii) address affected people's concerns and complaints promptly using an understandable and transparent process; iii) be readily accessible to all sections of the community at no cost and without retribution; and iv) not impede access to the Mongolian judicial or administrative remedies and ADB's Compliance Review Panel.

C. Current GRM Practice in Mongolia

420. Residents' complaints or concerns in Mongolia are generally taken directly to contactors or to bahg or soum Citizens Representative Hurals and/or bahg or soum government representatives. This approach focusses on taking complaints to lower administrative levels so mitigation actions can be taken quickly without delay, and elevating to higher levels if required.

D. Project GRM

1. Objective

421. The objective of the GRM is to prevent or address community concerns, reduce environmental and social 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: i) provide open channels for effective communication, including the identification of new social and environmental issues of concern arising from the project; ii) demonstrate concerns about community members and their social and environmental well-being; and iii) prevent and mitigate any adverse environmental and social impacts on communities caused by project implementation and operations. The GRM will be accessible to all members of the community.

2. GRM Stages and Timeframe

422. The five GRM stages and associated timeframes for the grievance redress process are presented below and illustrated in **Figure 89**.

Stage 1: Resolution at Local Level. If a concern arises, the AP may try to resolve the issue of concern directly with the relevant subproject contractor (during construction) or operator (during operation). If the concern is resolved successfully, no further action is required. Nonetheless, the contractor (during construction) and/or the operator (during operation) shall record any complaint and actions taken to resolve the issues and report the results to the relevant IA PIU. If no solution is found within 10 working days, the complainant is not satisfied with the suggested solution under Stage 1, or the AP does not wish to resolve the concern directly with the contractor or operator, proceed to Stage 2.

Stage 2: Complaint Eligibility Assessment and IA PIU Resolution. The AP will submit the grievance to the relevant subproject IA PIU (e.g. WES, AuES or NREC IA PIUs) directly or via local entry points, either verbally or in writing. Local entry points will include bahg or soum Citizens Representative Hurals, and/or bahg or soum government representatives. The IA PIU will make a written record of each complaint and assess its eligibility. If the complaint is deemed ineligible, e.g. related to an issue outside the scope of the Project, the IA PIU will provide the AP a clear written explanation of the decision within 5 working days.

If the complaint is deemed eligible the relevant IA PIU will register the complaint and inform the relevant entry point, contractor or operator, the EA PMU and the ADB. The IA PIU will take steps to investigate, communicate with all relevant stakeholders and identify a resolution within 10 working days of receipt of the complaint. This may involve instructing the contractor or operator to take corrective actions. Within 10 working days of the redress solution being agreed upon, the contractor or operator should implement the redress solution and convey the outcome to the EA PMU and the AP.

Stage 3: EA PMU Complaint Resolution. If no solution can be identified by the IA PIU or if the AP is not satisfied with the suggested solution under Stage 2, within two weeks of the end of Stage 2 the EA PMU will organize a multi-stakeholder meeting including relevant local government authorities. The meeting should result in a solution acceptable to all, and identify responsibilities and an action plan. The contractor or operator will implement the agreed redress solution and convey the outcome to the relevant IA PIU, AP and other stakeholders within 10 working days.

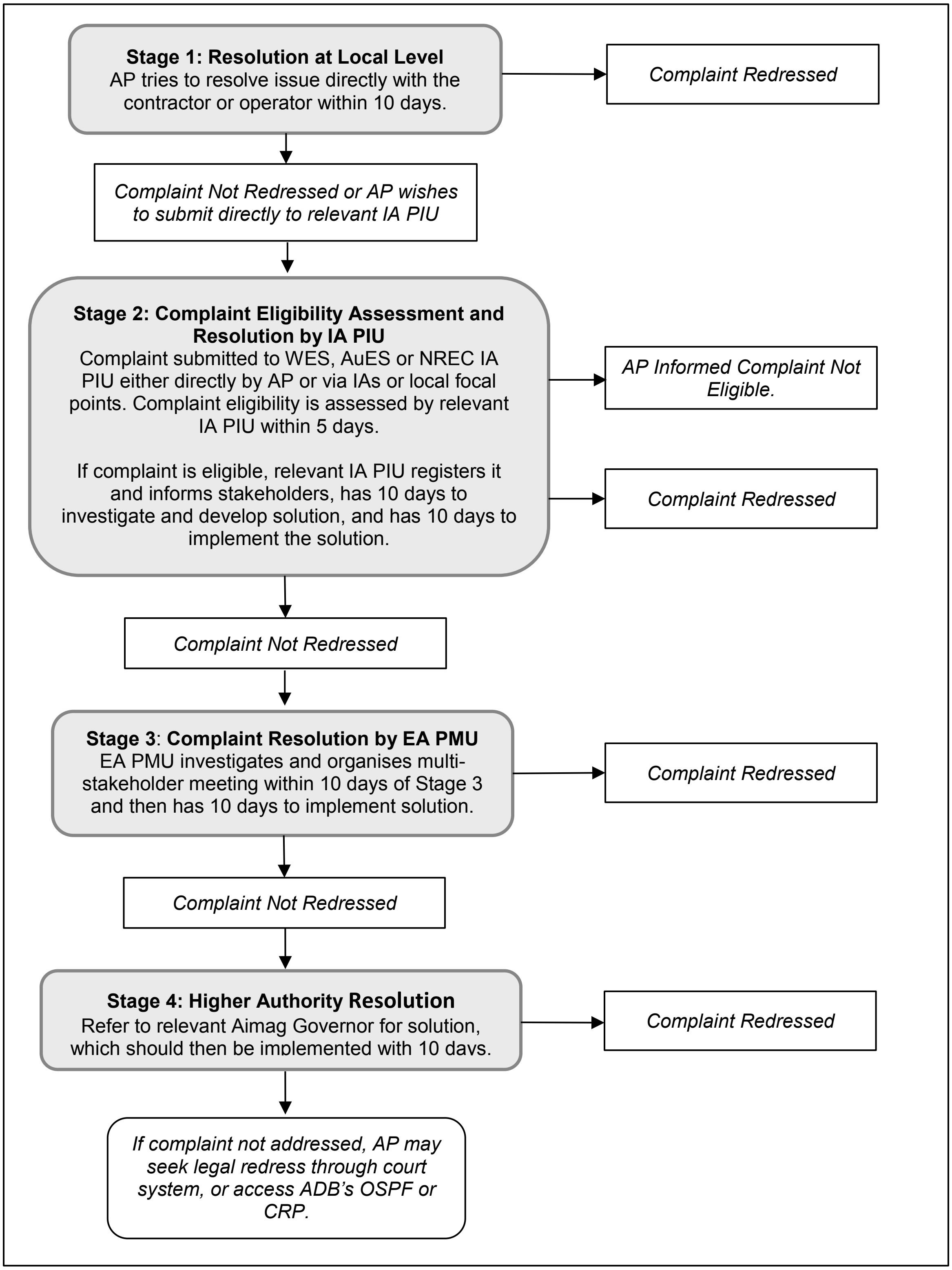
Stage 4: Higher Authority Resolution. If the multi-stakeholder meeting cannot resolve the problem, and the AP is unsatisfied, the EA PMU will set up a meeting with the relevant Aimag Governor's office to identify a solution, which should be then implemented within 7 days.

Stage 5: If the complainants are not satisfied with the suggested solution under Stage 4, the AP can access ADB's OSPF or CRP, or seek local legal address.

423. The IA PIUs will be the key contact point for locals who may require information about the Project or who would like to submit a grievance. The IA PIUs will issue public notices to inform the public within the subproject areas of the GRM and contact information (phone number, fax, address, email address) for the EA PMU and local entry points (e.g. the IA PIUs, local bagh,

soum or district officials, and the contractors).

Figure 89: Proposed Project GRM.



3. Reporting

424. Each IA PIU will record the complaint, investigation, and subsequent actions and results, and report this information to the EA PMU. The EA PMU will include this information in the environmental monitoring reports to the ADB.

425. The tracking and documenting of grievance resolution will include: i) tracking forms and procedures for gathering information from project personnel and complainant(s); ii) periodic reviews of complaints so as to recognize grievance patterns, identify any systemic causes of grievances, and periodically evaluate the overall functioning of the mechanism; iii) processes for informing stakeholders about the status of a case; and iv) procedures to retrieve data for reporting purposes, including the periodic reports to the EA and ADB.

IX. CONCLUSIONS

426. This is the IEE report for the proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) deliver clean electricity to remote and less developed regions while decarbonizing energy sector in Mongolia.

427. The Project is expected to result in significant benefits:

- The Project aims to upscale renewable distributed energy system in remote and less developed regions. It will increase Mongolia's installed RE capacity by more than 47% above 2017.

- The Project will benefit an estimated 71,828 households or 258,313 individuals (139,353 male and 118,960 female). This will result in approximately 50% of the local population in the targeted regions with access to clean energy.

- The Project will help Mongolia meet its Intended Nationally Determined Contributions (INDC) under the Paris climate accord.

- Project implementation will reduce electricity imports from the Siberian Grid by 94.3 GWh per year. GHG emission savings from project operation are estimated at 87,969 tons CO_2e per year or 2.2 million tons CO_2e over the project's 25 years lifetime. Reduced pollutant emissions are estimated at 306 tons of SO_2 annually (7,655 tons over the project lifetime), 385 tons of NOx annually (9,630 tons over the project lifetime), 59 tons of PM_{10} (1,482 tons over the project lifetime), and 49 tons of $PM_{2.5}$ (1,235 tons over the project lifetime).

- The Project will bring economic benefits, estimated at $7.5 million per year, in terms of substituting imported electricity from the Siberian grid in Russia. In 2016 electricity imports into Mongolia represented 19.9% of total consumption. The foreign exchange savings from avoided electricity imports can be redirected to other economic and social development activities in these regions.

428. The Project environmental assessment process has: i) identified potential negative environment impacts and appropriately established mitigation measures; ii) received public support from the project beneficiaries and affected people;(iii) established an effective project GRM procedure; and iv) prepared comprehensive subproject sub-EMPs including environmental management and supervision structure, environmental mitigation and monitoring plans, and capacity building and training.

429. Based on the analysis conducted it is concluded that overall the Project will result in significant positive environmental and socioeconomic benefits, and will not result in significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Any minimal adverse environmental impacts associated with the Project can be prevented, reduced, or minimized through the appropriate application of mitigation measures. It is therefore recommended that:

i) the project's categorization as ADB environment category B is confirmed;
ii) this IEE is considered sufficient to meet ADB's environmental safeguard requirements for the project, and no additional studies are required; and
iii) the project be supported by ADB, subject to the implementation of the

commitments contained in the EMP and allocation of appropriate technical, financial and human resources by the EA and IA to ensure these commitments are effectively and expediently implemented.

430. All potential subproject impacts and risks have been identified and mitigation measures proposed in the IEE. To ensure that the mitigation measures will be properly implemented, the EA shall:

i. ensure, and cause the Project Implementing Agencies to ensure, that the preparation, design, construction, implementation, operation and decommissioning of each Subproject, and that all Project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety; (b) the Environmental Safeguards; (c) the EARF; and (d) all measures and requirements set forth in the IEE, the EMP, and any corrective or preventative actions (i) set forth in a Safeguards Monitoring Report, or (ii) as subsequently agreed between ADB and the Borrower.

ii. shall make available, and cause the Project Implementing Agencies to make available, necessary budgetary and human resources to fully implement the EMPs.

iii. shall ensure, and cause the Project Implementing Agencies to ensure, that all bidding documents and Goods contracts which involve any civil works contain provisions that require contractors to: (a) comply with the measures relevant to the contractor set forth in the IEEs and the EMPs, and any corrective or preventative actions (i) set forth in a Safeguards Monitoring Report, or (ii) as subsequently agreed between ADB and the Borrower; (b) make available a budget for all such environmental and social measures; and(c) provide the Borrower or the Project Implementing Agencies, as the case may be, with a written notice of any unanticipated environmental risk or impact that arise during construction, implementation or operation of the Project that were not considered in the IEEs and the EMPs.

iv. do, or cause the Project Implementing Agencies to do, the following: (a) submit Safeguards Monitoring Reports to ADB semi-annually during construction and the implementation of the Project and the EMPs, and thereafter annually during operation, until the issuance of ADB's Project completion report unless a longer period is agreed in the EMPs, and disclose relevant information from such reports to respective affected people under Environmental Safeguards promptly upon submission; (b) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEEs and the EMPs, promptly inform ADB of the occurrence of such risk or impact, with detailed description of the event and proposed corrective action plan; and (c) report any actual or potential breach of compliance with the measures and requirements set forth in the EMPs promptly after becoming aware of the breach.

v. ensure, and cause the Project Implementing Agencies to ensure, that no proceeds of the Loan are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the Safeguards Policy Statement.

vi. ensure that the core labor standards and the applicable laws and regulations of the Borrower are complied with during Project implementation.

vii. cause the Project Implementing Agencies to include specific provisions in the bidding documents and contracts financed by ADB under the Project requiring that the contractors, among other things: (a) comply with the applicable labor law and regulations of the Borrower and incorporate applicable workplace occupational safety norms; (b) do not use child labor; (c) do not discriminate workers in respect of employment and occupation; (d) do not use forced labor; (e) allow freedom of association and effectively recognize the right to collective bargaining; and (f) disseminate, or engage appropriate service providers to disseminate, information on the risks of sexually transmitted diseases, including HIV/AIDS, to the employees of contractors engaged under the Project and to members of the local communities surrounding the Project area, particularly women.

APPENDIX I: UMNUGOVI SUBPROJECT ENVIRONMENTAL MANAGEMENT PLAN (SUB-EMP)

A. Introduction

1. The proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control while decarbonizing energy sector in Mongolia.

2. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 20219-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg, Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Khovd:	A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

3. A subproject EMP (sub-EMP) has been prepared for each phase I subproject. This is the sub-EMP for the Umnugovi subproject.

B. Objectives

4. The objectives of the sub-EMP are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) the project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009. Organizational responsibilities and budgets are clearly for execution, monitoring and reporting for pre-construction, construction, operation and decommissioning phases.

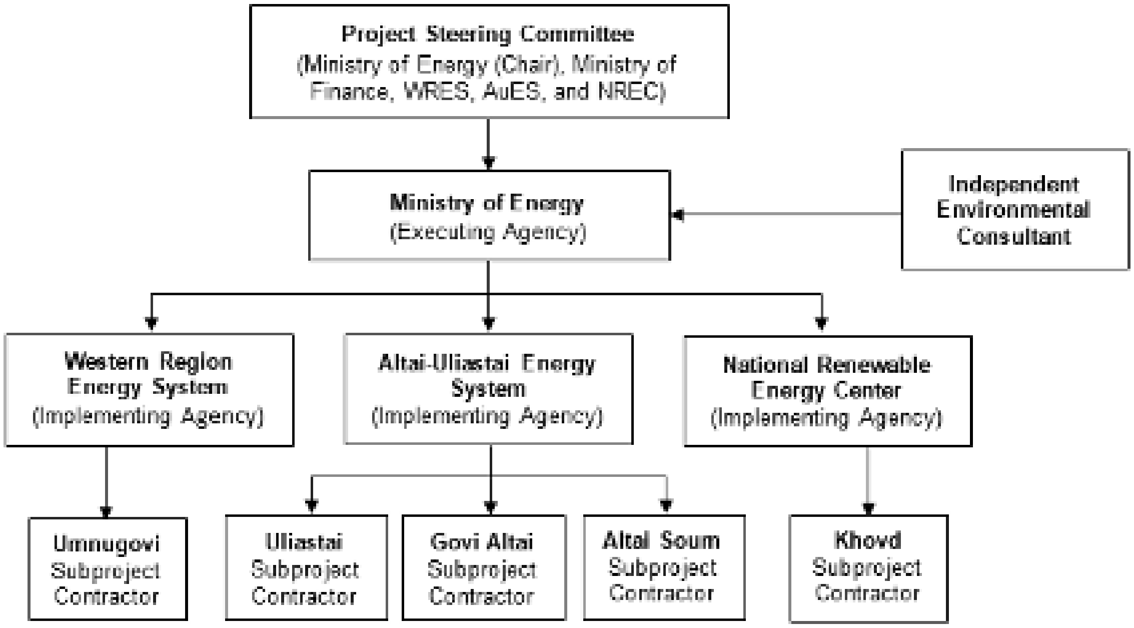
C. Implementation Arrangements

6. The MoE will be the Project EA. The WRES will be the IA for this subproject and have the day-to-day responsibility for implementing the subproject.

7. Construction contractors will be responsible for implementing the mitigation measures for each subproject. Contractors will be required to respond to the environmental specifications in the bidding documents in their proposals. Each contractor will also be required to develop a Construction Environmental Management Plan (CEMP) which outlines the way in which they will comply with the EMP, and will assign a person responsible for environment, health and safety. After Project completion, environmental management responsibilities will be handed over to the operation and maintenance units of the IAs.

8. The implementation arrangements for the Project are illustrated in Figure 1.

Figure 1: Project Implementation Arrangements.



D. Responsibilities for EMP Implementation

Steering Committee

9. Chaired by the MoE and including the Ministry of Finance (MoF), WES, AuES, and NREC, the Steering Committee will provide overall guidance to the Project implementation.

Ministry of Energy (MoE)

10. The MoE will be the EA for the project and the primary point of contact with ADB. It will appoint environmental and social safeguards staff to its Project Management Unit (MoE PMU), and will be responsible for overall project planning and management, coordination, and monitoring and supervision. In relation to environment safeguards, the MoE PMU will:

- Have overall responsibility for ensuring the implementation of the EMP.
- Ensure allocation of sufficient budget for EMP implementation and monitoring.
- Ensure compliance with loan assurances, including all the requirements specified in the sub-EMPs.
- Ensure that the necessary environmental clearances and permits are secured for the project.
- Provide coordination and supervision support to the subproject IAs.
- Coordinate resolution of complaints under the GRM.
- Liaise with ADB on the implementation of the sub-EMPs and corrective actions.
- Review the environmental monitoring reports submitted by the subproject IAs.
- Submit environmental monitoring reports to ADB for disclosure.
- Incorporate the results of the environmental monitoring reports into progress reports submitted to ADB.

Subproject Implementing Agency (IA)

11. The IA will appoint environmental and social safeguards focal point within the PIU. The IAs will have direct day-to-day responsibility for ensuring the implementation of the sub-EMPs, including:

- Revise the IEE and sub-EMPs as required during detailed design.
- Ensure that national EIA and revised IEE/sub-EMP requirements are included in the bidding documents and civil works contracts.
- Obtain all necessary environmental clearances and permits for the project.
- Coordinating delivery of the training program described in this sub-EMP.
- Require the contractors to develop CEMPs (one for each subproject) in compliance with the sub-EMP, and review and approve CEMPs.
- Ensure the contractors implement the CEMPs properly and in compliance with the requirements of the relevant sub-EMPs.
- Ensure that the contractors comply with the relevant environmental management and protection requirements and regulations of Mongolia and the ADB, and with any Project environmental or social loan covenants and assurances.
- Identify any environmental issues during implementation and propose necessary corrective actions.
- Undertake ongoing outreach and communications with project stakeholders and affected persons (APs).
- Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved.
- Ensure implementation of the environmental monitoring presented in the sub-EMPs environmental monitoring plans.
- Review and consolidate quarterly environmental monitoring reports submitted by the contractors.
- Prepare and submit consolidated semi-annual/annual environmental monitoring reports to MoE PMU for onward submission to ADB.

Subproject Contractors

12. The subproject contractors will be responsible for construction of the Project components, including implementing the relevant sub-EMP mitigation measures. The contractors will also submit quarterly environmental reports to their relevant IA PIU on sub-EMP implementation, and will be required to report any spills, accidents, fires and grievances received and take appropriate action.

Independent Environmental Consultant (IEC)

13. A qualified independent environmental consultant will be recruited to support the EA and IA PIUs in environmental monitoring, reporting, GRM implementation, and delivery of the training program.

Ministry of Environment and Tourism (MoET)

14. The MoET may undertake inspections and monitoring at their discretion.

ADB

15. ADB will conduct environment safeguard due diligence during Project review missions. ADB will review the semi-annual/annual environmental monitoring reports submitted by the EA PMU and will disclose the reports on its website. If the EA PMU fails to meet safeguards requirements described in the sub-EMPs, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

E. Potential Impacts and Mitigation Measures

16. The potential impacts of the subproject during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the EIA). Detailed impacts and mitigation measures are presented in **Table 1.**

16. The mitigation measures will be incorporated into subproject detailed design, bidding documents, construction contracts and operational management manuals. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

F. Environment Monitoring Plan

17. An environment monitoring plan (EMoP) to monitor the environmental impacts of the subproject and assess the effectiveness of mitigation measures is presented in **Table 2.** The EMoP is focused on compliance inspections undertaken by the IA PIU supported by the IEC. The results will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the subproject implementation; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of sub-EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 1: Umnugovi subproject EMP

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
A. Preconstruction Phase					
Detail Design Stage	Environmental Management Readiness	− This sub-EMP will be updated as required and incorporated into the detailed design. − The updated sub-EMP requirements will be incorporated into tender and contract documents. − A detailed assessment of earthquake risks will be undertaken and the result incorporated into the subproject designs as appropriate. − The subproject contractor will develop a subproject CEMP that outline the manner by which they will comply with the requirements of the IEE and sub-EMP. − In accordance with the GRM presented in Chapter VIII of the Project IEE, the EA PMU will be assigned overall responsibility for the GRM; GRM training will be provided for the contractors, the EA PMU, subproject IA PIU, and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disseminated at the construction site. − Residents and key stakeholders in will be informed and consulted.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA operations budget
B. Construction Phase					
Topography and Soils	Erosion, borrow and spoil	Good soil maintenance practices (where applicable): − Minimize the area of soil clearance. − Maintain slope stability at cut faces by implementing erosion protection measures. − Use temporary berms or other appropriate temporary drainage provisions to prevent stormwater runoff from entering adjacent water bodies. − Ensure that borrow areas are located away from residential areas, water bodies, dry river beds and valuable pasture/grazing land.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Dispose of spoil (if any) at spoil disposal sites identified in consultation with soum authorities. − After use, grade borrow and spoil areas to ensure drainage and visual uniformity.			
Ambient Air	Fugitive dust generated by construction activities, gaseous air pollution (SO_2, CO, NOx) from construction machinery	Good site maintenance practices implemented: − Stockpiles will be managed to reduce problematic fugitive dust emissions, including covering if necessary. Water spraying is to be used only if other techniques are unsuccessful. − The locations of the stockpiles will be downwind of sensitive receptors (if applicable). − Construction site management: Water will be sprayed on construction sites and material handling routes if monitoring indicates fugitive dust is impacting residents. − Transport of materials: Trucks carrying earth, sand or stone will be covered with tarpaulins or other suitable cover. Construction vehicles and machinery will be maintained to a high standard to minimize emissions; and − Manufacturing plants: Site any plants for the production of concrete at least 500 m downwind from the nearest dwelling.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Equipment Procurement	It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Surface and Ground Water	Construction and domestic wastewater	Good wastewater practices implemented: − Temporary drainage provision will be provided during construction to ensure that any storm water running off construction areas will be	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		controlled. − Construction sites will be equipped with adequate potable water and temporary sanitation facilities.			
Waste	Waste management and resource use	Good waste management practices and the adoption of the waste hierarchy: − The preference is for prevention of waste at source. Procurement options will play a role in waste prevention as the procurement of materials which have less packaging for example, would be preferable. Excavated soil will be used for backfilling to the maximum extent practical. Waste minimization is the second preferred option. This means the effective management of materials on site through good house-keeping and work planning, in order to generate less waste. Reuse or recycling options should be considered prior to disposal, separate containers for recyclables shall be used if there is a market for the materials. Disposal of waste which cannot be reused or recycled shall take place at sites authorized by authorities. − Storage and containment: Provide appropriate waste storage containers for worker's construction wastes, regularly haul to an approved disposal facility. − General Management: Prohibit burning of waste at all times.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Hazardous and polluting materials	Good waste management practices implemented: – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 m from drainage structures, important water bodies and other sensitive receptors. – Storage facilities for hazardous materials will be placed on impermeable surfaces with a storage capacity of at least 110% of the capacity of the hazardous materials	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		stored. – Signs will be placed at chemicals and hazardous materials storage sites to provide information on type and name of chemicals and hazardous materials. – Spill response procedures will be developed (including provision of absorbents at hazardous materials storage facilities), and all spills will be cleaned immediately. – Providers of hazardous materials will be responsible for removing and or recycling them if they become wastes, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained. – Vehicles and equipment will be properly maintained and refueled either off-site in local garages or other similar facilities. Washing or repair of machinery in or near surface waters is prohibited.			
Biological Resources	Impacts on Uvsiin Khar Us Lake IBA	– Site is 11.5 km from lake, and local authorities confirm that lake is saline and turbid, and does not provide habitat supporting migratory or resident waterfowl or other birds. Nonetheless, the Uvsiin Khar Us Lake IBA will be designated as a no-entry area by construction equipment, and no harvesting or collection of birds and other wildlife will be allowed.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Socio-economic Resources	Traffic Impacts	Good traffic and road management practices: – Transportation routes and delivery schedules planned in consultation with relevant road management authorities. – Any damage caused by construction traffic will be repaired by the subproject contractor. – Vehicles transporting construction materials or wastes will be required	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		to slow down when passing through or nearby sensitive locations.			
	Worker Occupational Health and Safety (OHS)	Good construction OHS practices implemented as per the general EHS Guidelines and the EHS Guidelines for Wind Energy: – All relevant Mongolian safety regulations will be strictly enforced. – All workers will be will be equipped with appropriate personal protective equipment (PPE), such as hard hats, insulating and/or fire resistant clothes, appropriate grounding, hot line and uninsulated tools, safety gloves, safety goggles, fall protection system including safety belts and other climbing gear (for work at heights), ear protection, etc. PPE will be maintained and replaced as necessary. – All work at height will be prohibited during non-daylight hours, during periods of fog, and during periods of strong wind. – Construction sites will be equipped with adequate potable water and temporary sanitation facilities. – Training will be provided to workers in all aspects of OHS, including prevention of communicable diseases (including HIV/AIDS) prior to the start of construction and on a regular basis (e.g. monthly briefings). Emergency Response Procedures (ERP): – Emergency response procedures will be developed, including communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. – Medical emergency response procedures will be developed covering both workers and community members (when affected	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emerge response, protocols for informing and transferring injured workers to local or provincial health centers, and record keeping. At least one trained first-aid worker will be available at the construction site. – Training will be provided to workers in all aspects of the ERP.			
	Community health and safety risks	Good community health and safety practices, including: − Outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language). − On site supervision personal (including night guards), as determined by the risk, to prevent unauthorized access to construction areas. − Signs will be placed at construction sites in clear view of the public. All sites will be made secure to avoid public access to the construction site.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	PCRs	If any chance finds of PCRs are encountered: − construction activities will be immediately suspended; − destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with Mongolian regulations; − the local Cultural Heritage Bureau will be promptly informed and consulted; and, − construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
C. Operation Phase					
Waste	Solid and Hazardous Wastes	− Domestic wastes will be collected and disposed at approved local waste disposal site following national regulations. − Equipment that requires replacement will be recycled by the equipment provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Wastes that are considered hazardous will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained.	Subproject Operator	EA	Subproject operating budget
Flooding	Flood damage	− Flood dykes to be provided to protect from flash flooding.	Subproject contractor	IA	Subproject construction budget
Flora and Fauna	Bird and bat collisions	− Site is 11.5 km from Uvsiin Khar Us Lake and migratory pathways. Local authorities have confirmed that Uvsiin Khar Us Lake is saline and turbid, and does not provide habitat supporting migratory or resident waterfowl or other birds. Subproject operation is not expected to have any significant impact on resident or migratory bird populations. − Nonetheless, bird and bat strikes will be monitored during implementation, and if necessary operational changes will be implemented. The nature of the operational change will depend on the nature of the recorded fatalities. For example, experience shows that bat fatalities can be significantly reduced by raising turbine cut in speed during periods when bats are active, with marginal annual power loss (less than 1% of total annual output). If	Subproject Operator, consultations with PMU safeguards staff, relevant specialists and ADB	EA, ADB	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		migratory bird fatalities are recorded, turbine operation can be curtailed during active migratory periods and times. In order to develop appropriate strategy the operators will consult with the PMU environmental safeguard staff and relevant specialists such as the Mongolian Wildlife Science and Conservation Centre, and ADB.			
	Bird electrocutions and collisions on power lines	Distribution OPL will feature bird friendly designs developed in consultation with the Mongolian Wildlife Science and Conservation Centre and the relevant local power company. Technical advice will also be sought from leading avian powerline interaction experts, such as guidelines produced by the Avian Power Line Interaction Committee (APLIC). Bird friendly design could include ensuring a safe distance between energized wires or between energized and grounded parts; designing crossarms, insulators and other parts of powerlines such that that birds find no opportunity to perch near energized power lines that might be hazardous; and, the use of marker balls, bird diverters, or other devices to increase line visibility.	Subproject Contractor in consultation with PMU safeguards staff, relevant specialists and ADB	IA PIU supported by IEC	Included in the construction contract
Occupational Health and Safety	Worker safety	Good operation OHS practices implemented as per the general EHS Guidelines and the EHS Guidelines for Wind Energy: − Workers will wear PPE, such as safety shoes or boots with non-slip soles, climbing gear, goggles, etc., to protect workers from potential safety hazards. − Check electrical equipment for safety before use; verify that all electric cables are properly insulated; take faulty or suspect electrical equipment to a qualified electricity technician for testing and repair. − All workers will undergo periodic examinations by occupational physician to reveal early symptoms of possible chronic effects or allergies; and	Subproject Operator	EA	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Health and safety will be incorporated into the regular staff training programs, including prevention of communicable diseases.			
	Community Health and Safety	− Wind turbines to be equipped with safety warning signs in Mongolian and anti-climbing devices.	Subproject Operator	EA	Subproject operating budget
Climate Risk	Adaptation to observed and Projected Climate Change	− Selection of turbines with a lower cut-in wind speed (less than 3.0 m/s), if available, to help address the observed trend in some locations of declining minimum wind speeds; − Supporting infrastructure such as power lines designed to survive future projected extreme wind speed events; and − Flood dykes and site drainage to be installed to protect sites from flash flooding.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA design and construction budgets

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

Table 2: Umnugovi subproject Environmental Monitoring Plan (EMoP)

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Pre-construction Phase						
Air Pollution	Dust/particulates	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Noise	Noise level	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
B. Construction Phase						
Erosion and Spoil	Compliance inspection of soil erosion management measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Air Pollution	Compliance inspection of site maintenance measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Surface and Groundwater	Visual compliance inspection of wastewater mitigation measures.	Construction sites	Monthly during construction of tower bases near rivers	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Flooding	Review of works scheduling to ensure works are not undertaken during risk times for flooding.	Contractors work plan	Review works schedule prior to start of construction, and periodically as required, especially prior to spring melts and summer rains.	PMU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Hazardous and Polluting Materials	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Socioeconomic Impacts	Visual inspection of construction site to check construction site safety, community safety, implementation of GRM, accidents involving public and workers, public complaints, etc.	Working sites near sensitive receptors	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Construction sites	Monthly	IA	EA, local environmental authority and MoET at their discretion	IA budget
	Compliance inspection to determine workers have appropriate PPE	All construction sites	Monthly	PMU safeguard staff supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
C. Operation Phase						
Solid and Hazardous Wastes	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Wastewater	Compliance inspection	Sanitary facilities	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Flora and Fauna	Bird strikes and deaths	Turbines	Monthly	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Health and Safety	Compliance inspection of worker and community health and safety measures	Turbines, Solar Farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Turbines, Solar Farms	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

G. Performance Indicators

18. Performance indicators (**Table 3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

Table 3: Performance Indicators

No.	Description	Indicators
1	Staffing	(i) EA PMU and IA PIUs established with appropriately qualified staff. (ii) IA PIUs designated with appropriately qualified staff. (iii) Appropriately qualified LEC recruited. (iv) 3rd party environmental monitoring station/company engaged if needed.
2	Budgeting	(i) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (ii) Environment monitoring cost is sufficiently and timely allocated. (iii) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(i) Compliance monitoring is conducted by EA PMU, IA PIUs, and LEC per EMoP. (ii) Pre-construction ambient and noise monitoring is conducted by IA PIUs or 3rd party environmental monitoring companies.
4	Supervision	(i) ADB mission to review EMP implementation at least once a year during the construction phase. (ii) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(i) Semi-annual (during construction period) and annual (during operation) subproject specific environmental monitoring reports prepared by EA PMU with the support of LEC. (ii) Semi-annual (during construction period) and annual (during operation) environmental monitoring reports are submitted to ADB.
6	Capacity Building	(i) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (ii) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of subproject implementation. (iii) Training on EMP implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	(i) GRM contact persons are designated at EA PMU and IA PIUs, and GRM contact information disclosed to the public before construction. (ii) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with Mongolian standards	(i) Project complies with the Mongolian environmental laws and regulations and meets all required standards.

H. Environment Reporting

Internal Reporting

19. During construction periods the subproject contractor will be responsible for conducting internal reporting on construction activities, including compliance with the EMP. Results will be reported through quarterly reports to the IA PIU.

20. The IA PIU will submit semi-annual reports to the EA PMU on sub-EMP implementation based on subproject contractor internal reporting and the results of compliance inspection monitoring.

Reporting to ADB

21. The EA PMU with support from the IEC will submit environmental monitoring reports semi-annually during construction and annually during operation on sub-EMP implementation to the ADB. The semi-annual/annual environmental monitoring reports will include (i) progress made in sub-EMP implementation; (ii) overall effectiveness of the sub-EMP implementation (including public and occupational health and safety); (iii) environmental monitoring and compliance; (iv) institutional strengthening and training; (v) public consultation, information disclosure and GRM; and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. ADB will disclose the English version of the reports on its website. An environmental monitoring report template is presented in **Appendix IX** of the IEE.

I. Training and Capacity Building

22. To ensure effective implementation of the sub-EMP, the capacity of the EA and IA PIUs and contractors will be strengthened. The main training emphasis will be to ensure that the contractors, IA PIU and EA PMU are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards. The training will focus on both construction and operation phases of the project. The training program is summarized in **Table 4.**

J. Estimated sub-EMP Budget

23. The estimated budgets for environmental mitigation and monitoring are summarized in **Table 5.**

K. Mechanisms for Feedback and Adjustment

24. Based on environmental inspection and monitoring reports, the EA PMU with the assistance from the IEC shall decide whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

25. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the sub-EMP will be made, if necessary. The need to update and adjust the EMP will be reviewed when there are design changes, changes in construction methods and program, negative environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. The EA PMU will inform ADB promptly on any changes to the project and needed adjustments to the sub-EMP. The

updated sub-EMP will be submitted to ADB for review and approval, and will be disclosed on the ADB project website.

Table 4: Institutional strengthening and training.

Topic	Attendees	Contents	Frequency	Cost USD
EMP Implementation	EA PMU, IA PIU, subproject contractors	EMP contents, EMP adjustment if needed, prepare CEMPs, roles and responsibilities, monitoring, supervision and reporting procedures	Once prior to project construction	5,000
Grievance Redress Mechanism (GRM)	EA PMU, IA PIU, subproject contractors	GRM procedures; roles and responsibilities		
Environmental Protection	EA PMU, IA PIU, subproject contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)		
Environmental Monitoring Plan (EMoP)	EA PMU, IA PIU, subproject contractors	Monitoring methods, data collection and reporting requirements		
Safety Training	EA PMU, IA PIU, subproject contractors	Traffic safety, construction safety, road safety, occupational safety		

Note: there is one training program covering all 4 subprojects.

Table 5: EMP budget.

EMP Item	Unit	Unit Cost	Estimated Sub-EMP Cost (USD)										Subtotal
			Umnugovi		Uliastai		Govi Altai		Altai Soum		Khovd		
			# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	
Construction Phase													
Mitigation Measures	Cost	-	- - - Included in Construction Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	6	$ 1,500	6	$ 1,500	6	$ 1,500	4	$ 1,000	2	$ 500	$ 6,000
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	$ 5,000
LIEC - National	Monthly Cost	$ 4,000	2	$ 8,000	2	$ 8,000	2	$ 8,000	1	$ 4,000	1	$ 4,000	$ 32,000
Subtotal				*$ 11,000*		*$ 11,000*		*$ 11,000*		*$ 6,500*		*$ 6,000*	***$ 45,500***
Operation Phase													
Mitigation Measures	Annual Cost	-	- - - Included in Operating Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	3	$ 750	3	$ 750	3	$ 750	2	$ 500	2	$ 500	$ 3,250
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
IEC - National	Monthly Cost	$ 4,000	1	$ 4,000	1	$ 4,000	1	$ 4,000	0.5	$ 2,000	0.5	$ 2,000	$ 16,000
Subtotal				*$ 5,750*		*$ 5,750*		*$ 5,750*		*$ 3,500*		*$ 3,500*	***$ 24,250***
TOTAL													***$ 69,750***

Source: ADB PPTA consultants.

APPENDIX II: ULIASTAI SUBPROJECT ENVIRONMENTAL MANAGEMENT PLAN (SUB-EMP)

A. Introduction

1. The proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control while decarbonizing energy sector in Mongolia.

2. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 2019-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg, Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Khovd:	A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

3. A subproject EMP (sub-EMP) has been prepared for each phase I subproject. This is the sub-EMP for the Uliastai subproject.

B. Objectives

4. The objectives of the sub-EMP are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) the project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009. Organizational responsibilities and budgets are clearly for execution, monitoring and reporting for pre-construction, construction, operation and decommissioning phases.

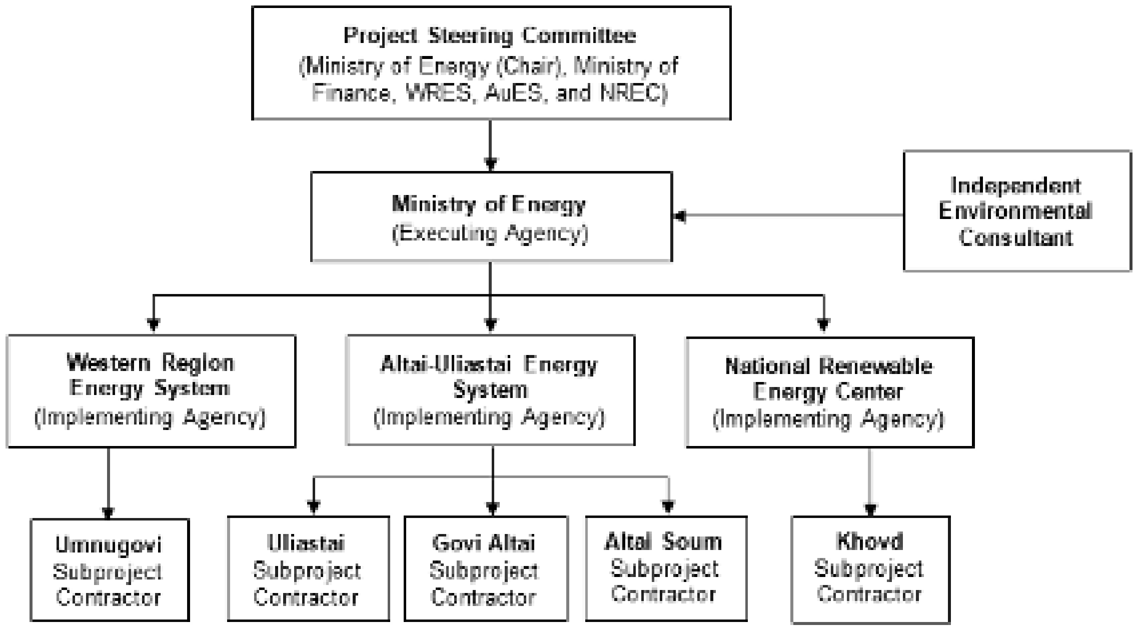
C. Implementation Arrangements

5. The MoE will be the Project EA. The AuES will be the IA for this subproject and have the day-to-day responsibility for implementing the subproject.

6. Construction contractors will be responsible for implementing the mitigation measures for each subproject. Contractors will be required to respond to the environmental specifications in the bidding documents in their proposals. Each contractor will also be required to develop a Construction Environmental Management Plan (CEMP) which outlines the way in which they will comply with the EMP, and will assign a person responsible for environment, health and safety. After Project completion, environmental management responsibilities will be handed over to the operation and maintenance units of the IAs.

7. The implementation arrangements for the Project are illustrated in Figure 1.

Figure 1: Project Implementation Arrangements.



D. Responsibilities for EMP Implementation

Steering Committee

8. Chaired by the MoE and including the Ministry of Finance (MoF), WES, AuES, and NREC, the Steering Committee will provide overall guidance to the Project implementation.

Ministry of Energy (MoE)

9. The MoE will be the EA for the project and the primary point of contact with ADB. It will appoint environmental and social safeguards staff to its Project Management Unit (MoE PMU), and will be responsible for overall project planning and management, coordination, and monitoring and supervision. In relation to environment safeguards, the MoE PMU will:

- Have overall responsibility for ensuring the implementation of the EMP.
- Ensure allocation of sufficient budget for EMP implementation and monitoring.
- Ensure compliance with loan assurances, including all the requirements specified in the sub-EMPs.
- Ensure that the necessary environmental clearances and permits are secured for the project.
- Provide coordination and supervision support to the subproject IAs.
- Coordinate resolution of complaints under the GRM.
- Liaise with ADB on the implementation of the sub-EMPs and corrective actions.
- Review the environmental monitoring reports submitted by the subproject IAs.
- Submit environmental monitoring reports to ADB for disclosure.
- Incorporate the results of the environmental monitoring reports into progress reports submitted to ADB.

Subproject Implementing Agency (IA)

10. The IA will appoint environmental and social safeguards focal point within the PIU. The IAs will have direct day-to-day responsibility for ensuring the implementation of the sub-EMPs, including:

- Revise the IEE and sub-EMPs as required during detailed design.
- Ensure that national EIA and revised IEE/sub-EMP requirements are included in the bidding documents and civil works contracts.
- Obtain all necessary environmental clearances and permits for the project.
- Coordinating delivery of the training program described in this sub-EMP.
- Require the contractors to develop CEMPs (one for each subproject) in compliance with the sub-EMP, and review and approve CEMPs.
- Ensure the contractors implement the CEMPs properly and in compliance with the requirements of the relevant sub-EMPs.
- Ensure that the contractors comply with the relevant environmental management and protection requirements and regulations of Mongolia and the ADB, and with any Project environmental or social loan covenants and assurances.
- Identify any environmental issues during implementation and propose necessary corrective actions.
- Undertake ongoing outreach and communications with project stakeholders and affected persons (APs).
- Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved.
- Ensure implementation of the environmental monitoring presented in the sub-EMPs environmental monitoring plans.
- Review and consolidate quarterly environmental monitoring reports submitted by the contractors.
- Prepare and submit consolidated semi-annual environmental monitoring reports to MoE PMU for onward submission to ADB.

Subproject Contractors

11. The subproject contractors will be responsible for construction of the Project components, including implementing the relevant sub-EMP mitigation measures. The contractors will also submit quarterly environmental reports to their relevant IA PIU on sub-EMP implementation, and will be required to report any spills, accidents, fires and grievances received and take appropriate action.

Independent Environmental Consultant (IEC)

12. A qualified independent environmental consultant will be recruited to support the EA and IA PIUs in environmental monitoring, reporting, GRM implementation, and delivery of the training program.

Ministry of Environment and Tourism (MoET)

13. The MoET may undertake inspections and monitoring at their discretion.

ADB

14. ADB will conduct environmental safeguard due diligence during Project review missions. ADB will review the semi-annual/annual environmental monitoring reports submitted by the EA PMU and will disclose the reports on its website. If the EA PMU fails to meet safeguards requirements described in the sub-EMPs, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

E. Potential Impacts and Mitigation Measures

15. The potential impacts of the subproject during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the EIA). Detailed impacts and mitigation measures are presented in **Table 1.**

16. The mitigation measures will be incorporated into subproject detailed design, bidding documents, construction contracts and operational management manuals. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

F. Environment Monitoring Plan

17. An environment monitoring plan (EMoP) to monitor the environmental impacts of the subproject and assess the effectiveness of mitigation measures is presented in **Table 2.** The EMoP is focused on compliance inspections undertaken by the IA PIU supported by the IEC. The results will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the subproject implementation; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of sub-EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 1: Uliastai subproject EMP.

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility: Implemented By	Responsibility: Supervised By	Source of Funds
A. Preconstruction Phase					
Detail Design Stage	Environmental Management Readiness	− This sub-EMP will be updated as required and incorporated into the detailed design. − The updated sub-EMP requirements will be incorporated into tender and contract documents. − A detailed assessment of earthquake risks will be undertaken and the result incorporated into the subproject designs as appropriate. − The subproject contractor will develop a subproject CEMP that outline the manner by which they will comply with the requirements of the IEE and sub-EMP. − In accordance with the GRM presented in Chapter VIII of the Project IEE, the EA PMU will be assigned overall responsibility for the GRM; GRM training will be provided for the contractors, EA PMU, subproject IA PIU, and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disseminated at the construction site. − Residents and key stakeholders in will be informed and consulted.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA operations budget
B. Construction Phase					
Topography and Soils	Erosion, borrow and spoil	Good soil maintenance practices (where applicable): − Minimize the area of soil clearance. − Maintain slope stability at cut faces by implementing erosion protection measures. − Use temporary berms or other appropriate temporary drainage provisions to prevent stormwater runoff from entering adjacent water bodies. − Ensure that borrow areas are located away from residential areas, water bodies, dry river beds and valuable pasture/grazing land.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Dispose of spoil (if any) at spoil disposal sites identified in consultation with soum authorities. − After use, grade borrow and spoil areas to ensure drainage and visual uniformity.			
Ambient Air	Fugitive dust generated by construction activities, gaseous air pollution (SO_2, CO, NOx) from construction machinery	Good site maintenance practices implemented: − Stockpiles will be managed to reduce problematic fugitive dust emissions, including covering if necessary. Water spraying is to be used only if other techniques are unsuccessful. − The locations of the stockpiles will be downwind of sensitive receptors (if applicable). − Construction site management: Water will be sprayed on construction sites and material handling routes if monitoring indicates fugitive dust is impacting residents. − Transport of materials: Trucks carrying earth, sand or stone will be covered with tarpaulins or other suitable cover. Construction vehicles and machinery will be maintained to a high standard to minimize emissions; and − Manufacturing plants: Site any plants for the production of concrete at least 500 m downwind from the nearest dwelling.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Equipment Procurement	It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Surface and Ground Water	Construction and domestic wastewater	Good wastewater practices implemented: − Temporary drainage provision will be provided during construction to ensure that any storm water running off construction areas will be	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		controlled. − Construction sites will be equipped with adequate potable water and temporary sanitation facilities.			
Flooding	Flood damage	− Avoid works during high precipitation periods.	Subproject contractor	IA	Subproject construction budget
Waste	Waste management and resource use	Good waste management practices and the adoption of the waste hierarchy: − The preference is for prevention of waste at source. Procurement options will play a role in waste prevention as the procurement of materials which have less packaging for example, would be preferable. Excavated soil will be used for backfilling to the maximum extent. Waste minimization is the second preferred option. This means the effective management of materials on site through good house-keeping and work planning, in order to generate less waste. Reuse or recycling options should be considered prior to disposal, separate containers for recyclables shall be used if there is a market for the materials. Disposal of waste which cannot be reused or recycled shall take place at sites authorized by authorities. − Storage and containment: Provide appropriate waste storage containers for worker's construction wastes, regularly haul to an approved disposal facility. − General Management: Prohibit burning of waste at all times.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Hazardous and polluting materials	Good waste management practices implemented: – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 m from drainage structures, important water bodies and other sensitive receptors. – Storage facilities for hazardous materials will be placed on	Subproject Contractor and Suppliers	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		impermeable surfaces with a storage capacity of at least 110% of the capacity of the hazardous materials stored. – Signs will be placed at chemicals and hazardous materials storage sites to provide information on type and name of chemicals and hazardous materials. – Spill response procedures will be developed (including provision of absorbents at hazardous materials storage facilities), and all spills will be cleaned immediately. – Providers of hazardous materials will be responsible for removing and or recycling them if they become wastes, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained. – Vehicles and equipment will be properly maintained and refueled either off-site in local garages or other similar facilities. Washing or repair of machinery in or near surface waters is prohibited.			
Socio-economic Resources	Traffic Impacts	Good traffic and road management practices: – Transportation routes and delivery schedules planned in consultation with relevant road management authorities. – Any damage caused by construction traffic will be repaired by the subproject contractor. – Vehicles transporting construction materials or wastes will be required to slow down when passing through or nearby sensitive receptors.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Worker Occupational Health and Safety (OHS)	Good construction OHS practices implemented as per the EHS Guidelines: – All relevant Mongolian safety regulations will be strictly enforced. – All workers will be will be equipped	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		with appropriate personal protective equipment (PPE), such as hard hats, insulating and/or fire resistant clothes, appropriate grounding, hot line and uninsulated tools, safety gloves, safety goggles, fall protection system including safety belts and other climbing gear (for work at heights), ear protection, etc. PPE will be maintained and replaced as necessary. – All work at height will be prohibited during non-daylight hours, during periods of fog, and during periods of strong wind. – Construction sites will be equipped with adequate potable water and temporary sanitation facilities. – Training will be provided to workers in all aspects of OHS, including prevention of communicable diseases (including HIV/AIDS) prior to the start of construction and on a regular basis (e.g. monthly briefings). Emergency Response Procedures (ERP): – Emergency response procedures will be developed, including communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. – Medical emergency response procedures will be developed covering both workers and community members (when affected by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emerge response, protocols for informing and transferring injured			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		workers to local or provincial health centers, and record keeping. At least one trained first-aid worker will be available at the construction site. – Training will be provided to workers in all aspects of the ERP.			
	Community health and safety risks	Good community health and safety practices, including: − Outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language). − On site supervision personal (including night guards), as determined by the risk, to prevent unauthorized access to construction areas. − Signs will be placed at construction site in clear view of the public and made secure to avoid public access to the construction site.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	PCRs	If any chance finds of PCRs are encountered: − construction activities will be immediately suspended; − destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with Mongolian regulations; − the local Cultural Heritage Bureau will be promptly informed and consulted; and, − construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility: Implemented By	Responsibility: Supervised By	Source of Funds
C. Operation Phase					
Water	Water Use	− Solar farms will make limited use of water for cleaning purposes. It is recommended that operators only clean twice during the high-power season, such as early and mid-summer. − Rainwater catchments will avoid the necessity of relying on well water or municipal (potable) water. Well water will be avoided as calcified water can do more harm than good.	Subproject Operator	EA	Subproject operating budget
Solar Glare	Impacts on airfield and road users	The Uliastai solar farm has been designed to minimize the risk of solar glare to drivers on the adjacent road the airfield. Specifically: − the PV arrays will be strongly tilted; − the PV array will have non-reflective surface coatings; and, − the solar farm will be close to the airfield so reflection risk is low.	EA and IA during design	EA	Construction budget
Waste	Solid and Hazardous Wastes	− Domestic wastes will be collected and disposed at approved local waste disposal site following national regulations. − Equipment that requires replacement will be recycled by the equipment provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Used batteries and panels will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Wastes that are considered hazardous will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained.	Subproject Operator	EA	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
Fauna	Bird electrocutions and collisions on power lines	Distribution OPL will feature bird friendly designs developed in consultation with the Mongolian Wildlife Science and Conservation Centre and the relevant local power company. Technical advice will also be sought from leading avian powerline interaction experts, such as guidelines produced by the Avian Power Line Interaction Committee (APLIC). Bird friendly design could include ensuring a safe distance between energized wires or between energized and grounded parts; designing crossarms, insulators and other parts of powerlines such that that birds find no opportunity to perch near energized power lines that might be hazardous; and, the use of marker balls, bird diverters, or other devices to increase line visibility.	Subproject Contractor in consultation with PMU safeguards staff, relevant specialists and ADB	IA PIU supported by IEC	Included in the construction contract
Occupational Health and Safety	Worker safety	Good operation OHS practices implemented as per the EHS Guidelines: − Workers will wear PPE, such as safety shoes or boots with non-slip soles, goggles, etc., to protect workers from potential safety hazards. − Check electrical equipment for safety before use; verify that all electric cables are properly insulated; take faulty or suspect electrical equipment to a qualified electricity technician for testing and repair. − All workers will undergo periodic examinations by occupational physician to reveal early symptoms of possible chronic effects or allergies; and − Health and safety will be incorporated into the regular staff training programs, including prevention of communicable diseases.	Subproject Operator	EA	Subproject operating budget
	Community Health and Safety	− Solar farm to be fenced and equipped with warning signs in Mongolian.	Subproject Operator	EA	Subproject operating budget
Climate Risk	Adaptation to observed	− Design parameter for all Project solar array supports be increased to	EA PMU and	EA and ADB	Included in EA and

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
	and Projected Climate Change	a range of -45 to +40°C; − Heat resistant materials and products to be used where available; − Solar arrays designed to withstand future projected extreme wind speed events; − Solar arrays monitored for dust accumulation, and cleaned on a regular and as necessary basis; and − Flood dykes and site drainage to be installed to protect sites from flash flooding. − Snow accumulations to be monitored and snow to be removed if necessary so as to avoid build up.	subproject IA PIU		subproject IA design, construction and operation budgets

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

Table 2: Uliastai subproject EMoP.

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Pre-construction Phase						
Air Pollution	Dust/particulates	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Noise	Noise level	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
B. Construction Phase						
Erosion and Spoil	Compliance inspection of soil erosion management measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Air Pollution	Compliance inspection of site maintenance measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Surface and Groundwater	Visual compliance inspection of wastewater mitigation measures.	Construction sites	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Hazardous and Polluting Materials	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Socioeconomic Impacts	Visual inspection of construction site to check construction site safety, community safety, implementation of GRM, accidents involving public and workers, public complaints, etc.	Working sites near sensitive receptors	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Solar farm	Monthly	IA	EA, local environmental authority and MoET at their discretion	IA budget
	Compliance inspection to determine workers have appropriate PPE	All construction sites	Monthly	PMU SS supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget
B. Operation Phase						
Water Use	Compliance inspection of solar panel cleaning water source	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Wastewater	Compliance inspection	Sanitary facilities	Annually	IA	EA	IA operating budget
Solid and Hazardous Wastes	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Health and Safety	Compliance inspection of worker and community health and safety measures	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

G. Performance Indicators

26. Performance indicators (**Table 3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

Table 3: Performance Indicators

No.	Description	Indicators
1	Staffing	(i) EA PMU and IA PIUs established with appropriately qualified staff. (ii) IA PIUs designated with appropriately qualified staff. (iii) Appropriately qualified LEC recruited. (iv) 3rd party environmental monitoring station/company engaged if needed.
2	Budgeting	(iv) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (v) Environment monitoring cost is sufficiently and timely allocated. (vi) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(iii) Compliance monitoring is conducted by EA PMU, IA PIUs, and LEC per EMoP. (iv) Pre-construction ambient and noise monitoring is conducted by IA PIUs or 3rd party environmental monitoring companies.
4	Supervision	(iii) ADB mission to review EMP implementation at least once a year during the construction phase. (iv) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(iii) Semi-annual (during construction period) and annual (during operation) subproject specific environmental monitoring reports prepared by EA PMU with the support of LEC. (iv) Semi-annual (during construction period) and annual (during operation) environmental monitoring reports are submitted to ADB.
6	Capacity Building	(iv) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (v) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of subproject implementation. (vi) Training on EMP implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	(iii) GRM contact persons are designated at EA PMU and IA PIUs, and GRM contact information disclosed to the public before construction. (iv) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with Mongolian standards	(ii) Project complies with the Mongolian environmental laws and regulations and meets all required standards.

H. Environment Reporting

Internal Reporting

18. During construction periods the subproject contractor will be responsible for conducting internal reporting on construction activities, including compliance with the EMP. Results will be reported through quarterly reports to the IA PIU.

19. The IA PIU will submit semi-annual reports to the EA PMU on sub-EMP implementation based on subproject contractor internal reporting and the results of compliance inspection monitoring.

Reporting to ADB

27. The EA PMU with support from the IEC will submit environmental monitoring reports semi-annually during construction and annually during operation on sub-EMP implementation to the ADB. The semi-annual environmental monitoring reports will include (i) progress made in sub-EMP implementation; (ii) overall effectiveness of the sub-EMP implementation (including public and occupational health and safety); (iii) environmental monitoring and compliance; (iv) institutional strengthening and training; (v) public consultation, information disclosure and GRM; and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. ADB will disclose the English version of the reports on its website. An environmental monitoring report template is presented in **Appendix IX** of the IEE.

I. Training and Capacity Building

20. To ensure effective implementation of the sub-EMP, the capacity of the EA PMU and IA PIUs and contractors will be strengthened. The main training emphasis will be to ensure that the contractors, IA PIU and EA PMU are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards. The training will focus on both construction and operation phases of the project. The training program is summarized in **Table 4.**

J. Estimated sub-EMP Budget

21. The estimated budgets for environmental mitigation and monitoring are summarized in **Table 5.**

K. Mechanisms for Feedback and Adjustment

22. Based on environmental inspection and monitoring reports, the EA PMU with the assistance from the IEC shall decide whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

23. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the sub-EMP will be made, if necessary. The need to update and adjust the EMP will be reviewed when there are design changes, changes in construction methods and program, negative environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. The EA PMU will inform ADB promptly on any changes to the project and needed adjustments to the sub-EMP. The

updated sub-EMP will be submitted to ADB for review and approval, and will be disclosed on the ADB project website.

Table 4: Institutional strengthening and training.

Topic	Attendees	Contents	Frequency	Cost USD
EMP Implementation	EA PMU, IA PIU, subproject contractors	EMP contents, EMP adjustment if needed, prepare CEMPs, roles and responsibilities, monitoring, supervision and reporting procedures	Once prior to project construction	5,000
Grievance Redress Mechanism (GRM)	EA PMU, IA PIU, subproject contractors	GRM procedures; roles and responsibilities		
Environmental Protection	EA PMU, IA PIU, subproject contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)		
Environmental Monitoring Plan (EMoP)	EA PMU, IA PIU, subproject contractors	Monitoring methods, data collection and reporting requirements		
Safety Training	EA PMU, IA PIU, subproject contractors	Traffic safety, construction safety, road safety, occupational safety		

Note: there is one training program covering all 4 subprojects.

Table 5: EMP budget.

EMP Item	Unit	Unit Cost	Estimated Sub-EMP Cost (USD)										Subtotal
			Umnugovi		Uliastai		Govi Altai		Altai Soum		Khovd		
			# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	
Construction Phase													
Mitigation Measures	Cost	-	- - - Included in Construction Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	6	$ 1,500	6	$ 1,500	6	$ 1,500	4	$ 1,000	2	$ 500	$ 6,000
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	$ 5,000
LIEC - National	Monthly Cost	$ 4,000	2	$ 8,000	2	$ 8,000	2	$ 8,000	1	$ 4,000	1	$ 4,000	$ 32,000
Subtotal				*$ 11,000*		*$ 11,000*		*$ 11,000*		*$ 6,500*		*$ 6,000*	***$ 45,500***
Operation Phase													
Mitigation Measures	Annual Cost	-	- - - Included in Operating Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	3	$ 750	3	$ 750	3	$ 750	2	$ 500	2	$ 500	$ 3,250
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
IEC - National	Monthly Cost	$ 4,000	1	$ 4,000	1	$ 4,000	1	$ 4,000	0.5	$ 2,000	0.5	$ 2,000	$ 16,000
Subtotal				*$ 5,750*		*$ 5,750*		*$ 5,750*		*$ 3,500*		*$ 3,500*	***$ 24,250***
TOTAL													***$ 69,750***

Source: ADB PPTA consultants.

APPENDIX III: GOVI ALTAI SUBPROJECT ENVIRONMENTAL MANAGEMENT PLAN (SUB-EMP)

A. Introduction

1. The proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control while decarbonizing energy sector in Mongolia.

2. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 2019-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg, Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Khovd:	A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

3. A subproject EMP (sub-EMP) has been prepared for each phase I subproject. This is the sub-EMP for the Umnugovi subproject.

B. Objectives

4. The objectives of the sub-EMP are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) the project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009. Organizational responsibilities and budgets are clearly for execution, monitoring and reporting for pre-construction, construction, operation and decommissioning phases.

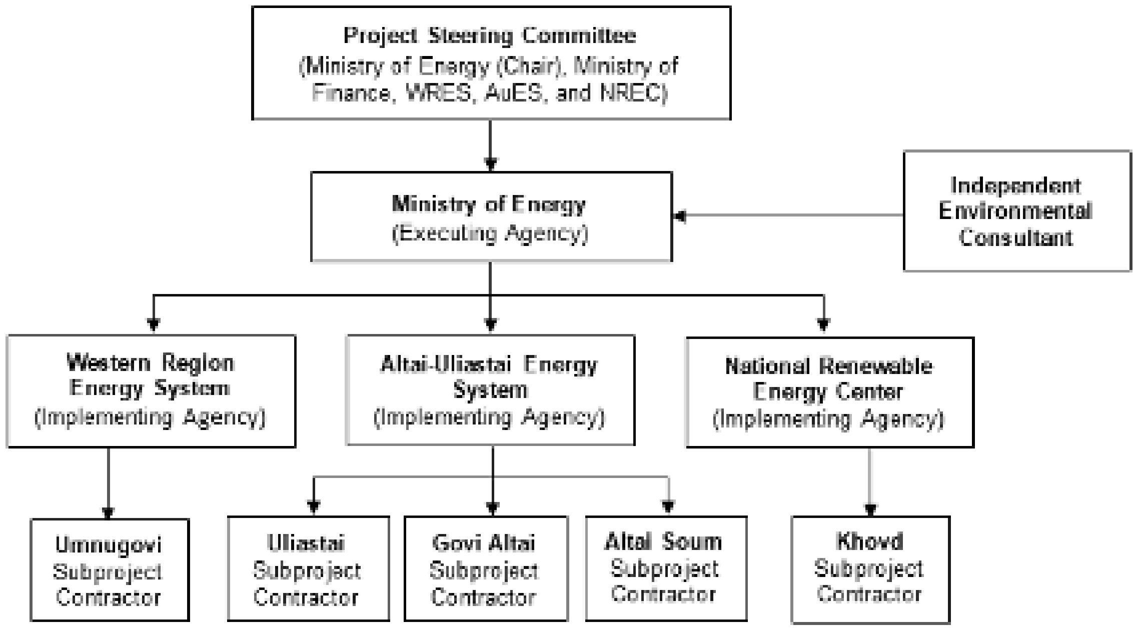
C. Implementation Arrangements

5. The MoE will be the Project EA. The AuES will be the IA for this subproject and have the day-to-day responsibility for implementing the subproject.

6. Construction contractors will be responsible for implementing the mitigation measures for each subproject. Contractors will be required to respond to the environmental specifications in the bidding documents in their proposals. Each contractor will also be required to develop a Construction Environmental Management Plan (CEMP) which outlines the way in which they will comply with the EMP, and will assign a person responsible for environment, health and safety. After Project completion, environmental management responsibilities will be handed over to the operation and maintenance units of the IAs.

7. The implementation arrangements for the Project are illustrated in Figure 1.

Figure 1: Project Implementation Arrangements.



D. Responsibilities for EMP Implementation

Steering Committee

8. Chaired by the MoE and including the Ministry of Finance (MoF), WES, AuES, and NREC, the Steering Committee will provide overall guidance to the Project implementation.

Ministry of Energy (MoE)

9. The MoE will be the EA for the project and the primary point of contact with ADB. It will appoint environmental and social safeguards staff to its Project Management Unit (MoE PMU), and will be responsible for overall project planning and management, coordination, and monitoring and supervision. In relation to environment safeguards, the MoE PMU will:

- Have overall responsibility for ensuring the implementation of the EMP.
- Ensure allocation of sufficient budget for EMP implementation and monitoring.
- Ensure compliance with loan assurances, including all the requirements specified in the sub-EMPs.
- Ensure that the necessary environmental clearances and permits are secured for the project.
- Provide coordination and supervision support to the subproject IAs.
- Coordinate resolution of complaints under the GRM.
- Liaise with ADB on the implementation of the sub-EMPs and corrective actions.
- Review the environmental monitoring reports submitted by the subproject IAs.
- Submit environmental monitoring report to ADB for disclosure.
- Incorporate the results of the environmental monitoring reports into progress reports submitted to ADB.

Subproject Implementing Agency (IA)

10. The IA will appoint environmental and social safeguards focal point within the PIU. The IA will have direct day-to-day responsibility for ensuring the implementation of the sub-EMPs, including:

- Revise the IEE and sub-EMPs as required during detailed design.
- Ensure that national EIA and revised IEE/sub-EMP requirements are included in the bidding documents and civil works contracts.
- Obtain all necessary environmental clearances and permits for the project.
- Coordinating delivery of the training program described in this sub-EMP.
- Require the contractors to develop CEMPs (one for each subproject) in compliance with the sub-EMP, and review and approve CEMPs.
- Ensure the contractors implement the CEMPs properly and in compliance with the requirements of the relevant sub-EMPs.
- Ensure that the contractors comply with the relevant environmental management and protection requirements and regulations of Mongolia and the ADB, and with any Project environmental or social loan covenants and assurances.
- Identify any environmental issues during implementation and propose necessary corrective actions.
- Undertake ongoing outreach and communications with project stakeholders and affected persons (APs).
- Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved.
- Ensure implementation of the environmental monitoring presented in the sub-EMPs environmental monitoring plans.
- Review and consolidate quarterly environmental monitoring reports submitted by the contractors.
- Prepare and submit consolidated semi-annual/annual environmental monitoring reports to MoE PMU for onward submission to ADB.

Subproject Contractors

11. The subproject contractors will be responsible for construction of the Project components, including implementing the relevant sub-EMP mitigation measures. The contractors will also submit quarterly environmental reports to their relevant IA PIU on sub-EMP implementation, and will be required to report any spills, accidents, fires and grievances received and take appropriate action.

Independent Environmental Consultant (IEC)

12. A qualified independent environmental consultant will be recruited to support the EA PMU and IA PIUs in environmental monitoring, reporting, GRM implementation, and delivery of the training program.

Ministry of Environment and Tourism (MoET)

13. The MoET may undertake inspections and monitoring at their discretion.

ADB

14. ADB will conduct environmental safeguard due diligence during Project review missions. ADB will review the semi-annual/annual environmental monitoring reports submitted by the EA PMU and will disclose the reports on its website. If the EA PMU fails to meet safeguards requirements described in the sub-EMPs, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

E. Potential Impacts and Mitigation Measures

15. The potential impacts of the subproject during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the EIA). Detailed impacts and mitigation measures are presented in **Table 1.**

16. The mitigation measures will be incorporated into subproject detailed design, bidding documents, construction contracts and operational management manuals. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

F. Environment Monitoring Plan

17. An EMoP to monitor the environmental impacts of the subproject and assess the effectiveness of mitigation measures is presented in **Table 2.** The EMoP is focused on compliance inspections undertaken by the IA PIU supported by the IEC. The results will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the subproject implementation; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of sub-EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 1: Govi Altai subproject EMP.

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
A. Preconstruction Phase					
Detail Design Stage	Environmental Management Readiness	− This sub-EMP will be updated as required and incorporated into the detailed design. − The updated sub-EMP requirements will be incorporated into tender and contract documents. − A detailed assessment of earthquake risks will be undertaken and the result incorporated into the subproject designs as appropriate. − The subproject contractor will develop a subproject CEMP that outline the manner by which they will comply with the requirements of the IEE and sub-EMP. − In accordance with the GRM presented in Chapter VIII of the Project IEE, the EA PMU will be assigned overall responsibility for the GRM; GRM training will be provided for the contractors, EA PMU, subproject IA PIU, and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disseminated at the construction site. − Residents and key stakeholders in will be informed and consulted.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA operations budget
B. Construction Phase					
Topography and Soils	Erosion, borrow and spoil	Good soil maintenance practices (where applicable): − Minimize the area of soil clearance. − Maintain slope stability at cut faces by implementing erosion protection measures. − Use temporary berms or other appropriate temporary drainage provisions to prevent stormwater runoff from entering adjacent water bodies. − Ensure that borrow areas are located away from residential areas, water bodies, dry river beds and valuable pasture/grazing land.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Dispose of spoil (if any) at spoil disposal sites identified in consultation with soum authorities. − After use, grade borrow and spoil areas to ensure drainage and visual uniformity.			
Ambient Air	Fugitive dust generated by construction activities, gaseous air pollution (SO_2, CO, NOx) from construction machinery	Good site maintenance practices implemented: − Stockpiles will be managed to reduce problematic fugitive dust emissions, including covering if necessary. Water spraying is to be used only if other techniques are unsuccessful. − The locations of the stockpiles will be downwind of sensitive receptors (if applicable). − Construction site management: Water will be sprayed on construction sites and material handling routes if monitoring indicates fugitive dust is impacting residents. − Transport of materials: Trucks carrying earth, sand or stone will be covered with tarpaulins or other suitable cover. Construction vehicles and machinery will be maintained to a high standard to minimize emissions; and − Manufacturing plants: Site any plants for the production of concrete at least 500 m downwind from the nearest dwelling.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Equipment Procurement	It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Surface and Ground Water	Construction and domestic wastewater	Good wastewater practices implemented: − Temporary drainage provision will be provided during construction to ensure that any storm water running off construction areas will be	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		controlled. − Construction sites will be equipped with adequate potable water and temporary sanitation facilities.			
Flooding	Flood damage	− Avoid works during high precipitation periods.	Subproject contractor	IA	Subproject construction budget
Waste	Waste management and resource use	Good waste management practices and the adoption of the waste hierarchy: − The preference is for prevention of waste at source. Procurement options will play a role in waste prevention as the procurement of materials which have less packaging for example, would be preferable. Excavated soil will be used for backfilling to the maximum extent. Waste minimization is the second preferred option. This means the effective management of materials on site through good house-keeping and work planning, in order to generate less waste. Reuse or recycling options should be considered prior to disposal, separate containers for recyclables shall be used if there is a market for the materials. Disposal of waste which cannot be reused or recycled shall take place at sites authorized by authorities. − Storage and containment: Provide appropriate waste storage containers for worker's construction wastes, regularly haul to an approved disposal facility. − General Management: Prohibit burning of waste at all times.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Hazardous and polluting materials	Good waste management practices implemented: – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 m from drainage structures, important water bodies and other sensitive receptors. – Storage facilities for hazardous materials will be placed on	Subproject Contractor and Suppliers	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		impermeable surfaces with a storage capacity of at least 110% of the capacity of the hazardous materials stored. – Signs will be placed at chemicals and hazardous materials storage sites to provide information on type and name of chemicals and hazardous materials. – Spill response procedures will be developed (including provision of absorbents at hazardous materials storage facilities), and all spills will be cleaned immediately. – Providers of hazardous materials will be responsible for removing and or recycling them if they become wastes, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained. – Vehicles and equipment will be properly maintained and refueled either off-site in local garages or other similar facilities. Washing or repair of machinery in or near surface waters is prohibited.			
Socio-economic Resources	Traffic Impacts	Good traffic and road management practices: – Transportation routes and delivery schedules planned in consultation with relevant road management authorities. – Any damage caused by construction traffic will be repaired by the subproject contractor. – Vehicles transporting construction materials or wastes will be required to slow down when passing through or nearby sensitive locations.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Worker Occupational Health and Safety (OHS)	Good construction OHS practices implemented as per the EHS Guidelines: – All relevant Mongolian safety regulations will be strictly enforced. – All workers will be will be equipped	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility: Implemented By	Responsibility: Supervised By	Source of Funds
		with appropriate personal protective equipment (PPE), such as hard hats, insulating and/or fire resistant clothes, appropriate grounding, hot line and uninsulated tools, safety gloves, safety goggles, fall protection system including safety belts and other climbing gear (for work at heights), ear protection, etc. PPE will be maintained and replaced as necessary. – All work at height will be prohibited during non-daylight hours, during periods of fog, and during periods of strong wind. – Construction sites will be equipped with adequate potable water and temporary sanitation facilities. – Training will be provided to workers in all aspects of OHS, including prevention of communicable diseases (including HIV/AIDS) prior to the start of construction and on a regular basis (e.g. monthly briefings). Emergency Response Procedures (ERP): – Emergency response procedures will be developed, including communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. – Medical emergency response procedures will be developed covering both workers and community members (when affected by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emerge response, protocols for informing and transferring injured			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		workers to local or provincial health centers, and record keeping. At least one trained first-aid worker will be available at the construction site. – Training will be provided to workers in all aspects of the ERP.			
	Community health and safety risks	Good community health and safety practices, including: − Outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language). − On site supervision personal (including night guards), as determined by the risk, to prevent unauthorized access to construction areas. − Signs will be placed at construction site in clear view of the public and made secure to avoid public access.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	PCRs	If any chance finds of PCRs are encountered: − construction activities will be immediately suspended; − destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with Mongolian regulations; − the local Cultural Heritage Bureau will be promptly informed and consulted; and, − construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
C. Operation Phase					
Water	Water Use	− Solar farms will make limited use of water for cleaning purposes. It is recommended that operators only clean twice during the high-power season, such as early and mid-summer. − Rainwater catchments will avoid the necessity of relying on well water or municipal (potable) water. Well water will be avoided as calcified water can do more harm than good.	Subproject Operator	EA	Subproject operating budget
Solar Glare	Impacts on airport and road users	The Govi Altai solar farm has been designed to minimize the risk of solar glare to drivers on the adjacent road the airfield. Specifically: − the PV arrays will be strongly tilted; − the PV array will have non-reflective surface coatings; − the solar farm will be close to the airfield so reflection risk is low; and − PV arrays will be parallel to the adjacent road to Khovd and the airfield, but panels will be facing to the south.	EA and IA during design	EA	Construction budget
Waste	Solid and Hazardous Wastes	− Domestic wastes will be collected and disposed at approved local waste disposal site. − Equipment that requires replacement will be recycled by the equipment provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Used batteries and panels will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Wastes that are considered hazardous will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − All exports of hazardous wastes must be with the review and	Subproject Operator	EA	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		approval of the MoET, and all necessary export licenses must be obtained.			
Fauna	Bird electrocutions and collisions on power lines	Distribution OPL will feature bird friendly designs developed in consultation with the Mongolian Wildlife Science and Conservation Centre and the relevant local power company. Technical advice will also be sought from leading avian powerline interaction experts, such as guidelines produced by the Avian Power Line Interaction Committee (APLIC). Bird friendly design could include ensuring a safe distance between energized wires or between energized and grounded parts; designing crossarms, insulators and other parts of powerlines such that that birds find no opportunity to perch near energized power lines that might be hazardous; and, the use of marker balls, bird diverters, or other devices to increase line visibility.	Subproject Contractor in consultation with PMU safeguards staff, relevant specialists and ADB	IA PIU supported by IEC	Included in the construction contract
Occupational Health and Safety	Worker safety	Good operation OHS practices implemented as per the EHS Guidelines: − Workers will wear PPE, such as safety shoes or boots with non-slip soles, goggles, etc., to protect workers from potential safety hazards. − Check electrical equipment for safety before use; verify that all electric cables are properly insulated; take faulty or suspect electrical equipment to a qualified electricity technician for testing and repair. − All workers will undergo periodic examinations by occupational physician to reveal early symptoms of possible chronic effects or allergies; and − Health and safety will be incorporated into the regular staff training programs, including prevention of communicable diseases.	Subproject Operator	EA	Subproject operating budget
	Community Health and	− Solar farm to be fenced and equipped with warning signs in	Subproject Operator	EA	Subproject operating

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
	Safety	Mongolian.			budget
Climate Risk	Adaptation to observed and Projected Climate Change	− Design parameter for all Project solar array supports be increased to a range of -45 to +40 °C; − Heat resistant materials and products to be used where available; − Solar arrays designed to withstand future projected extreme wind speed events; − Solar arrays monitored for dust accumulation, and cleaned on a regular and as necessary basis; and − Flood dykes and site drainage to be installed to protect sites from flash flooding. − Snow accumulations to be monitored and snow to be removed if necessary so as to avoid build up.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA design, construction and operation budgets

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

Table 2: Govi Altai subproject EMoP

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Pre-construction Phase						
Air Pollution	Dust/particulates	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Noise	Noise level	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
B. Construction Phase						
Erosion and Spoil	Compliance inspection of soil erosion management measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Air Pollution	Compliance inspection of site maintenance measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Surface and Groundwater	Visual compliance inspection of wastewater mitigation measures.	Construction sites	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Hazardous and Polluting Materials	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Socioeconomic Impacts	Visual inspection of construction site to check construction site safety, community safety, implementation of GRM, accidents involving public and workers, public complaints, etc.	Working sites near sensitive receptors	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Construction sites	Monthly	IA	EA, local environmental authority and MoET at their discretion	IA budget
	Compliance inspection to determine workers have appropriate PPE	All construction sites	Monthly	PMU environmental and social staff supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget
B. Operation Phase						
Water Use	Compliance inspection of solar panel cleaning water source	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Wastewater	Compliance inspection	Sanitary facilities	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Solid and Hazardous Wastes	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Health and Safety	Compliance inspection of worker and community health and safety measures	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

G. Performance Indicators

28. Performance indicators (**Table 3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

Table 3: Performance Indicators

No.	Description	Indicators
1	Staffing	(i) EA PMU and IA PIUs established with appropriately qualified staff. (ii) IA PIUs designated with appropriately qualified staff. (iii) Appropriately qualified LEC recruited. (iv) 3rd party environmental monitoring station/company engaged if needed.
2	Budgeting	(vii) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (viii) Environment monitoring cost is sufficiently and timely allocated. (ix) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(v) Compliance monitoring is conducted by EA PMU, IA PIUs, and LEC per EMoP. (vi) Pre-construction ambient and noise monitoring is conducted by IA PIUs or 3rd party environmental monitoring companies.
4	Supervision	(v) ADB mission to review EMP implementation at least once a year during the construction phase. (vi) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(v) Semi-annual (during construction period) and annual (during operation) subproject specific environmental monitoring reports prepared by EA PMU with the support of LEC. (vi) Semi-annual (during construction period) and annual (during operation) environmental monitoring reports are submitted to ADB.
6	Capacity Building	(vii) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (viii) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of subproject implementation. (ix) Training on EMP implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	(v) GRM contact persons are designated at EA PMU and IA PIUs, and GRM contact information disclosed to the public before construction. (vi) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with Mongolian standards	(iii) Project complies with the Mongolian environmental laws and regulations and meets all required standards.

H. Environment Reporting

18. The environmental reporting requirements during the implementation of the project are summarized in the **Table 3**.

Internal Reporting

19. During construction periods the subproject contractor will be responsible for conducting internal reporting on construction activities, including compliance with the EMP. Results will be reported through quarterly reports to the IA PIU.

20. The IA PIU will submit semi-annual reports to the EA PMU on sub-EMP implementation based on subproject contractor internal reporting and the results of compliance inspection monitoring.

Reporting to ADB

21. The EA PMU with support from the IEC will submit environmental monitoring reports semi-annually during construction and annually during operation on sub-EMP implementation to the ADB. The semi-annual/annual environmental monitoring reports will include (i) progress made in sub-EMP implementation; (ii) overall effectiveness of the sub-EMP implementation (including public and occupational health and safety); (iii) environmental monitoring and compliance; (iv) institutional strengthening and training; (v) public consultation, information disclosure and GRM; and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. ADB will disclose the English version of the reports on its website. An environmental monitoring report template is presented in IEE **Appendix IX.**

I. Training and Capacity Building

22. To ensure effective implementation of the sub-EMP, the capacity of the EA and IA PIUs and contractors will be strengthened. The main training emphasis will be to ensure that the contractors, IA PIU and EA PMU are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards. The training will focus on both construction and operation phases of the project. The training program is summarized in **Table 4.**

J. Estimated sub-EMP Budget

23. The estimated budgets for environmental mitigation and monitoring are summarized in **Table 5.**

K. Mechanisms for Feedback and Adjustment

24. Based on environmental inspection and monitoring reports, the EA PMU with the assistance from the IEC shall decide whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

25. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the sub-EMP will be made, if necessary. The need to update and adjust the EMP will be reviewed when there are design changes, changes in

construction methods and program, negative environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. The EA PMU will inform ADB promptly on any changes to the project and needed adjustments to the sub-EMP. The updated sub-EMP will be submitted to ADB for review and approval, and will be disclosed on the ADB project website.

Table 4: Institutional strengthening and training.

Topic	Attendees	Contents	Frequency	Cost USD
EMP Implementation	EA PMU, IA PIU, subproject contractors	EMP contents, EMP adjustment if needed, prepare CEMPs, roles and responsibilities, monitoring, supervision and reporting procedures	Once prior to project construction	5,000
Grievance Redress Mechanism (GRM)	EA PMU, IA PIU, subproject contractors	GRM procedures; roles and responsibilities		
Environmental Protection	EA PMU, IA PIU, subproject contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)		
Environmental Monitoring Plan (EMoP)	EA PMU, IA PIU, subproject contractors	Monitoring methods, data collection and reporting requirements		
Safety Training	EA PMU, IA PIU, subproject contractors	Traffic safety, construction safety, road safety, occupational safety		

Note: there is one training program covering all 4 subprojects.

Table 5: EMP budget.

EMP Item	Unit	Unit Cost	Estimated Sub-EMP Cost (USD)										Subtotal
			Umnugovi		Uliastai		Govi Altai		Altai Soum		Khovd		
			# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	
Construction Phase													
Mitigation Measures	Cost	-	- - - Included in Construction Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	6	$ 1,500	6	$ 1,500	6	$ 1,500	4	$ 1,000	2	$ 500	$ 6,000
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	$ 5,000
LIEC - National	Monthly Cost	$ 4,000	2	$ 8,000	2	$ 8,000	2	$ 8,000	1	$ 4,000	1	$ 4,000	$ 32,000
Subtotal				*$ 11,000*		*$ 11,000*		*$ 11,000*		*$ 6,500*		*$ 6,000*	***$ 45,500***
Operation Phase													
Mitigation Measures	Annual Cost	-	- - - Included in Operating Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	3	$ 750	3	$ 750	3	$ 750	2	$ 500	2	$ 500	$ 3,250
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
IEC - National	Monthly Cost	$ 4,000	1	$ 4,000	1	$ 4,000	1	$ 4,000	0.5	$ 2,000	0.5	$ 2,000	$ 16,000
Subtotal				*$ 5,750*		*$ 5,750*		*$ 5,750*		*$ 3,500*		*$ 3,500*	***$ 24,250***
TOTAL													***$ 69,750***

Source: ADB PPTA consultants.

APPENDIX IV: ALTAI SOUM SUBPROJECT ENVIRONMENTAL MANAGEMENT PLAN (SUB-EMP)

A. Introduction

1. The proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control while decarbonizing energy sector in Mongolia.

2. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 2019-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg, Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Khovd:	A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

3. A subproject EMP (sub-EMP) has been prepared for each phase I subproject. This is the sub-EMP for the Umnugovi subproject.

B. Objectives

4. The objectives of the sub-EMP are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) the project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009. Organizational responsibilities and budgets are clearly for execution, monitoring and reporting for pre-construction, construction, operation and decommissioning phases.

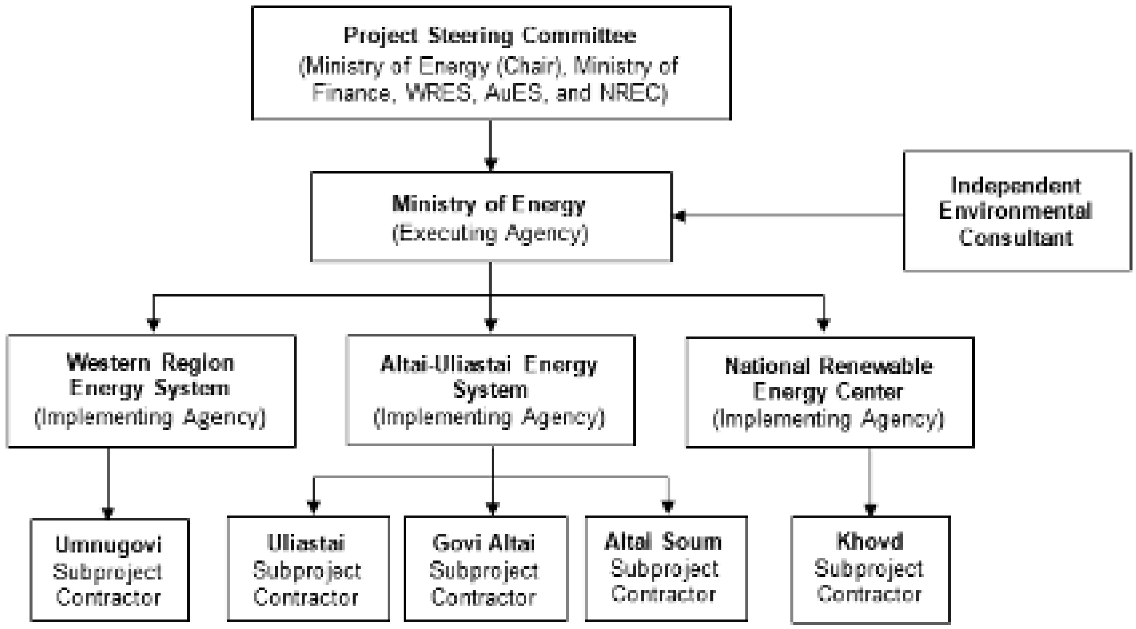
C. Implementation Arrangements

5. The MoE will be the Project Executing Agency EA. The AuES will be the IA for this subproject and have day-to-day responsibility for implementing the subproject.

6. Construction contractors will be responsible for implementing the mitigation measures for each subproject. Contractors will be required to respond to the environmental specifications in the bidding documents in their proposals. Each contractor will also be required to develop a Construction Environmental Management Plan (CEMP) which outlines the way in which they will comply with the EMP, and will assign a person responsible for environment, health and safety. After Project completion, environmental management responsibilities will be handed over to the operation and maintenance units of the IAs.

7. The implementation arrangements for the Project are illustrated in Figure 1.

Figure 1: Project Implementation Arrangements.



D. Responsibilities for EMP Implementation

Steering Committee

8. Chaired by the MoE and including the Ministry of Finance (MoF), WES, AuES, and NREC, the Steering Committee will provide overall guidance to the Project implementation.

Ministry of Energy (MoE)

9. The MoE will be the EA for the project and the primary point of contact with ADB. It will appoint environmental and social safeguards staff to its Project Management Unit (MoE PMU), and will be responsible for overall project planning and management, coordination, and monitoring and supervision. In relation to environment safeguards, the MoE PMU will:

- Have overall responsibility for ensuring the implementation of the EMP.
- Ensure allocation of sufficient budget for EMP implementation and monitoring.
- Ensure compliance with loan assurances, including all the requirements specified in the sub-EMPs.
- Ensure that the necessary environmental clearances and permits are secured for the project.
- Provide coordination and supervision support to the subproject IAs.
- Coordinate resolution of complaints under the GRM.
- Liaise with ADB on the implementation of the sub-EMPs and corrective actions.
- Review the environmental monitoring reports submitted by the subproject IAs.
- Submit environmental monitoring reports to ADB for disclosure.
- Incorporate the results of the environmental monitoring reports into progress reports submitted to ADB.

Subproject Implementing Agency (IA)

10. The IA will appoint environmental and social safeguards focal point within the PIU. The IAs will have direct day-to-day responsibility for ensuring the implementation of the sub-EMPs, including:

- Revise the IEE and sub-EMPs as required during detailed design.
- Ensure that national EIA and revised IEE/sub-EMP requirements are included in the bidding documents and civil works contracts.
- Obtain all necessary environmental clearances and permits for the project.
- Coordinating delivery of the training program described in this sub-EMP.
- Require the contractors to develop CEMPs (one for each subproject) in compliance with the sub-EMP, and review and approve CEMPs.
- Ensure the contractors implement the CEMPs properly and in compliance with the requirements of the relevant sub-EMPs.
- Ensure that the contractors comply with the relevant environmental management and protection requirements and regulations of Mongolia and the ADB, and with any Project environmental or social loan covenants and assurances.
- Identify any environmental issues during implementation and propose necessary corrective actions.
- Undertake ongoing outreach and communications with project stakeholders and affected persons (APs).
- Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved.
- Ensure implementation of the environmental monitoring presented in the sub-EMPs environmental monitoring plans.
- Review and consolidate quarterly environmental monitoring reports submitted by the contractors.
- Prepare and submit consolidated semi-annual/annual environmental monitoring reports to MoE PMU for onward submission to ADB.

Subproject Contractors

11. The subproject contractors will be responsible for construction of the Project components, including implementing the relevant sub-EMP mitigation measures. The contractors will also submit quarterly environmental reports to their relevant IA PIU on sub-EMP implementation, and will be required to report any spills, accidents, fires and grievances received and take appropriate action.

Independent Environmental Consultant (IEC)

12. A qualified independent environmental consultant will be recruited to support the EA and IA PIUs in environmental monitoring, reporting, GRM implementation, and delivery of the training program.

Ministry of Environment and Tourism (MoET)

13. The MoET may undertake inspections and monitoring at their discretion.

ADB

14. ADB will conduct environmental safeguard due diligence during Project review missions. ADB will review the semi-annual/annual environmental monitoring reports submitted by the EA PMU and will disclose the reports on its website. If the EA PMU fails to meet safeguards requirements described in the sub-EMPs, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

E. Potential Impacts and Mitigation Measures

15. The potential impacts of the subproject during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the EIA). Detailed impacts and mitigation measures are presented in **Table 1.**

16. The mitigation measures will be incorporated into subproject detailed design, bidding documents, construction contracts and operational management manuals. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

F. Environment Monitoring Plan

17. An EMoP to monitor the environmental impacts of the subproject and assess the effectiveness of mitigation measures is presented in **Table 2.** The EMoP is focused on compliance inspections undertaken by the IA PIU supported by the IEC. The results will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the subproject implementation; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of sub-EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 1: Altai Soum subproject EMP.

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
A. Preconstruction Phase					
Detail Design Stage	Environmental Management Readiness	− This sub-EMP will be updated as required and incorporated into the detailed design. − The updated sub-EMP requirements will be incorporated into tender and contract documents. − A detailed assessment of earthquake risks will be undertaken and the result incorporated into the subproject designs as appropriate. − The subproject contractor will develop a subproject CEMP that outline the manner by which they will comply with the requirements of the IEE and sub-EMP. − In accordance with the GRM presented in Chapter VIII of the Project IEE, the EA PMU will be assigned overall responsibility for the GRM; GRM training will be provided for the contractors, EA PMU, subproject IA PIU, and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disseminated at the construction site. − Residents and key stakeholders in will be informed and consulted.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA operations budget
B. Construction Phase					
Topography and Soils	Erosion, borrow and spoil	Good soil maintenance practices (where applicable): − Minimize the area of soil clearance. − Maintain slope stability at cut faces by implementing erosion protection measures. − Use temporary berms or other appropriate temporary drainage provisions to prevent stormwater runoff from entering adjacent water bodies. − Ensure that borrow areas are located away from residential areas, water bodies, dry river beds and valuable pasture/grazing land.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Dispose of spoil (if any) at spoil disposal sites identified in consultation with soum authorities. − After use, grade borrow and spoil areas to ensure drainage and visual uniformity.			
Ambient Air	Fugitive dust generated by construction activities, gaseous air pollution (SO_2, CO, NOx) from construction machinery	Good site maintenance practices implemented: − Stockpiles will be managed to reduce problematic fugitive dust emissions, including covering if necessary. Water spraying is to be used only if other techniques are unsuccessful. − The locations of the stockpiles will be downwind of sensitive receptors (if applicable). − Construction site management: Water will be sprayed on construction sites and material handling routes if monitoring indicates fugitive dust is impacting residents. − Transport of materials: Trucks carrying earth, sand or stone will be covered with tarpaulins or other suitable cover. Construction vehicles and machinery will be maintained to a high standard to minimize emissions; and − Manufacturing plants: Site any plants for the production of concrete at least 500 m downwind from the nearest dwelling.	Subproject Contractor	IA PIU supported by IEC	Included in the constructio n contract
	Equipment Procurement	It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.	Subproject Contractor	IA PIU supported by IEC	Included in the constructio n contract
Surface and Ground Water	Construction and domestic wastewater	Good wastewater practices implemented: − Temporary drainage provision will be provided during construction to ensure that any storm water running off construction areas will be	Subproject Contractor	IA PIU supported by IEC	Included in the constructio n contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		controlled. − Construction sites will be equipped with adequate potable water and temporary sanitation facilities.			
Flooding	Flood damage	− Avoid works during high precipitation periods.	Subproject contractor	IA	Subproject construction budget
Waste	Waste management and resource use	Good waste management practices and the adoption of the waste hierarchy: − The preference is for prevention of waste at source. Procurement options will play a role in waste prevention as the procurement of materials which have less packaging for example, would be preferable. Excavated soil will be used for backfilling to the maximum extent. Waste minimization is the second preferred option. This means the effective management of materials on site through good house-keeping and work planning, in order to generate less waste. Reuse or recycling options should be considered prior to disposal, separate containers for recyclables shall be used if there is a market for the materials. Disposal of waste which cannot be reused or recycled shall take place at sites authorized by authorities. − Storage and containment: Provide appropriate waste storage containers for worker's construction wastes, regularly haul to an approved disposal facility. − General Management: Prohibit burning of waste at all times.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Hazardous and polluting materials	Good waste management practices implemented: – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 m from drainage structures, important water bodies and other sensitive receptors. – Storage facilities for hazardous materials will be placed on	Subproject Contractor and Suppliers	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		impermeable surfaces with a storage capacity of at least 110% of the capacity of the hazardous materials stored. – Signs will be placed at chemicals and hazardous materials storage sites to provide information on type and name of chemicals and hazardous materials. – Spill response procedures will be developed (including provision of absorbents at hazardous materials storage facilities), and all spills will be cleaned immediately. – Providers of hazardous materials will be responsible for removing and or recycling them if they become wastes, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. – The providers of new batteries will be responsible for collecting, transporting and recycling the existing battery bank either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. – All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained. – Vehicles and equipment will be properly maintained and refueled either off-site in local garages or other similar facilities. Washing or repair of machinery in or near surface waters is prohibited.			
Socio-economic Resources	Traffic Impacts	Good traffic and road management practices: – Transportation routes and delivery schedules planned in consultation with relevant road management authorities. – Any damage caused by construction traffic will be repaired by the subproject contractor. – Vehicles transporting construction	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		materials or wastes will be required to slow down when passing through or nearby sensitive locations.			
	Worker Occupational Health and Safety (OHS)	Good construction OHS practices implemented as per the general EHS Guidelines and the EHS Guidelines for Wind Energy : – All relevant Mongolian safety regulations will be strictly enforced. – All workers will be will be equipped with appropriate personal protective equipment (PPE), such as hard hats, insulating and/or fire resistant clothes, appropriate grounding, hot line and uninsulated tools, safety gloves, safety goggles, fall protection system including safety belts and other climbing gear (for work at heights), ear protection, etc. PPE will be maintained and replaced as necessary. – All work at height will be prohibited during non-daylight hours, during periods of fog, and during periods of strong wind. – Construction sites will be equipped with adequate potable water and temporary sanitation facilities. – Training will be provided to workers in all aspects of OHS, including prevention of communicable diseases prior to the start of construction and on a regular basis (e.g. monthly briefings). – Emergency Response Procedures (ERP): – Emergency response procedures will be developed, including communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. – Medical emergency response procedures will be developed covering both workers and	Subproject Contractor	IA PIU supported by IEC	Included in the constructio n contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		community members (when affected by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emerge response, protocols for informing and transferring injured workers to local or provincial health centers, and record keeping. At least one trained first-aid worker will be available at the construction site. – Training will be provided to workers in all aspects of the ERP.			
	Community health and safety risks	Good community health and safety practices, including: − Outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language). − On site supervision personal (including night guards), as determined by the risk, to prevent unauthorized access to construction areas. − Signs will be placed at construction sites in clear view of the public and made secure to avoid public access.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	PCRs	If any chance finds of PCRs are encountered: − construction activities will be immediately suspended; − destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with Mongolian regulations; − the local Cultural Heritage Bureau will be promptly informed and consulted; and, − construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
C. Operation Phase					
Water	Water Use	− Solar farms will make limited use of water for cleaning purposes. It is recommended that operators only clean twice during the high-power season, such as early and mid-summer. − Rainwater catchments will avoid the necessity of relying on well water or municipal (potable) water. Well water will be avoided as calcified water can do more harm than good.	Subproject Operator	EA	Subproject operating budget
Waste	Solid and Hazardous Wastes	− Domestic wastes will be collected and disposed at approved local waste disposal site. − Equipment that requires replacement will be recycled by the equipment provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Used batteries will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Wastes that are considered hazardous will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained.	Subproject Operator	EA	Subproject operating budget
Flooding	Flood damage	− Flood dykes to be provided to protect from flash flooding.	Subproject contractor	IA	Subproject construction budget
Flora and Fauna	Bird collisions	− Wind farm sited away from migratory routes. − Bird and bat strikes will be monitored during implementation, and if necessary operational changes will be implemented. The nature of the operational change will depend on the nature of the	Subproject Operator, consultations with PMU safeguards staff, relevant specialists	EA, ADB	Subproject construction/ operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		recorded fatalities. For example, experience shows that bat fatalities can be significantly reduced by raising turbine cut in speed during periods when bats are active, with marginal annual power loss (less than 1% of total annual output). If migratory bird fatalities are recorded, turbine operation can be curtailed during active migratory periods and times. In order to develop appropriate strategy the operators will consult with the PMU environmental safeguard staff and relevant specialists such as the Mongolian Wildlife Science and Conservation Centre, and ADB.	and ADB		
	Bird electrocutions and collisions on power lines	Distribution OPL will feature bird friendly designs developed in consultation with the Mongolian Wildlife Science and Conservation Centre and the relevant local power company. Technical advice will also be sought from leading avian powerline interaction experts, such as guidelines produced by the Avian Power Line Interaction Committee (APLIC). Bird friendly design could include ensuring a safe distance between energized wires or between energized and grounded parts; designing crossarms, insulators and other parts of powerlines such that that birds find no opportunity to perch near energized power lines that might be hazardous; and, the use of marker balls, bird diverters, or other devices to increase line visibility.	Subproject Contractor in consultation with PMU safeguards staff, relevant specialists and ADB	IA PIU supported by IEC	Included in the construction contract
Occupational Health and Safety	Worker safety	Good operation OHS practices implemented as per the general EHS Guidelines and the EHS Guidelines for Wind Energy: − Workers will wear PPE, such as safety shoes or boots with non-slip soles, climbing gear, goggles, etc., to protect workers from potential safety hazards. − Check electrical equipment for safety before use; verify that all electric cables are properly insulated; take faulty or suspect electrical equipment to a qualified	Subproject Operator	EA	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		electricity technician for testing and repair. − All workers will undergo periodic examinations by occupational physician to reveal early symptoms of possible chronic effects or allergies; and − Health and safety will be incorporated into the regular staff training programs, including prevention of communicable diseases.			
	Community Health and Safety	− Wind turbines to be equipped with safety warning signs in Mongolian and anti-climbing devices. − Solar farms to be fenced and equipped with warning signs in Mongolian.	Subproject Operator	EA	Subproject operating budget
Climate Risk	Adaptation to observed and Projected Climate Change	For the wind turbines: − Selection of turbines with a lower cut-in wind speed (less than 3.0 m/s), if available, to help address the observed trend in some locations of declining minimum wind speeds; − Supporting infrastructure such as power lines designed to survive future projected extreme wind speed events; and − Flood dykes and site drainage to be installed to protect sites from flash flooding. For the solar PV: − Design parameter for all Project solar array supports be increased to a range of -45 to +40 °C; − Heat resistant materials and products to be used where available; − Solar arrays designed to withstand future projected extreme wind speed events; − Solar arrays monitored for dust accumulation, and cleaned on a regular and as necessary basis; and − Flood dykes and site drainage to be installed to protect sites from flash flooding. − Snow accumulations to be monitored and snow to be removed if necessary so as to avoid build up.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA design, construction and operation budgets

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

Table 2: Altai Soum subproject Environmental Monitoring Plan (EMoP)

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Pre-construction Phase						
Air Pollution	Dust/particulates	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Noise	Noise level	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Well Water	Quality	Nearest 2 wells	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
B. Construction Phase						
Erosion and Spoil	Compliance inspection of soil erosion management measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Air Pollution	Compliance inspection of site maintenance measures.	Construction sites, spoil disposal sites	Monthly during construction; and once after completion of spoil disposal	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Surface and Groundwater	Visual compliance inspection of wastewater mitigation measures.	Construction sites	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Flooding	Review of works scheduling to ensure works are not undertaken during risk times for flooding.	Contractors work plan	Review works schedule prior to start of construction, and periodically as required, especially prior to spring melts and summer rains.	PMU environmental and social staff supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Hazardous and Polluting Materials	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Socioeconomic Impacts	Visual inspection of construction site to check construction site safety, community safety, implementation of GRM, accidents involving public and workers, public complaints, etc.	Working sites near sensitive receptors	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Construction sites	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
	Compliance inspection to determine workers have appropriate PPE	All construction sites	Monthly	PMU SS supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget
C. Operation Phase						
Solid and Hazardous Wastes	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Wastewater	Compliance inspection	Sanitary facilities	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Flora and Fauna	Turbines	Bird strikes and deaths	Monthly	IA	EA, local environmental authority and MoET at their discretion	IA operating budget
Health and Safety	Compliance inspection of worker and community health and safety measures	Turbines and solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Turbines and solar farm	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

G. Performance Indicators

29. Performance indicators (**Table 3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

Table 3: Performance Indicators

No.	Description	Indicators
1	Staffing	(i) EA PMU and IA PIUs established with appropriately qualified staff. (ii) IA PIUs designated with appropriately qualified staff. (iii) Appropriately qualified LEC recruited. (iv) 3rd party environmental monitoring station/company engaged if needed.
2	Budgeting	(x) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (xi) Environment monitoring cost is sufficiently and timely allocated. (xii) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(vii) Compliance monitoring is conducted by EA PMU, IA PIUs, and LEC per EMoP. (viii) Pre-construction ambient and noise monitoring is conducted by IA PIUs or 3rd party environmental monitoring companies.
4	Supervision	(vii) ADB mission to review EMP implementation at least once a year during the construction phase. (viii) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(vii) Semi-annual (during construction period) and annual (during operation) subproject specific environmental monitoring reports prepared by EA PMU with the support of LEC. (viii) Semi-annual (during construction period) and annual (during operation) environmental monitoring reports are submitted to ADB.
6	Capacity Building	(x) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (xi) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of subproject implementation. (xii) Training on EMP implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	(vii) GRM contact persons are designated at EA PMU and IA PIUs, and GRM contact information disclosed to the public before construction. (viii) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with Mongolian standards	(iv) Project complies with the Mongolian environmental laws and regulations and meets all required standards.

H. Environment Reporting

18. The environmental reporting requirements during the implementation of the project are summarized in the **Table 3**.

Internal Reporting

19. During construction periods the subproject contractor will be responsible for conducting internal reporting on construction activities, including compliance with the EMP. Results will be reported through quarterly reports to the IA PIU.

20. The IA PIU will submit semi-annual reports to the EA PMU on sub-EMP implementation based on subproject contractor internal reporting and the results of compliance inspection monitoring.

Reporting to ADB

21. The EA PMU with support from the IEC will submit environmental monitoring reports semi-annually during construction and annually during operation (as part of the project semiannual progress reports) on sub-EMP implementation to the ADB. The semi-annual environmental monitoring reports will include (i) progress made in sub-EMP implementation; (ii) overall effectiveness of the sub-EMP implementation (including public and occupational health and safety); (iii) environmental monitoring and compliance; (iv) institutional strengthening and training; (v) public consultation, information disclosure and GRM; and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. ADB will disclose the English version of the reports on its website. An environmental monitoring report template is presented in **Appendix IX** of the IEE.

I. Training and Capacity Building

22. To ensure effective implementation of the sub-EMP, the capacity of the EA and IA PIUs and contractors will be strengthened. The main training emphasis will be to ensure that the contractors, IA PIU and EA PMU are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards. The training will focus on both construction and operation phases of the project. The training program is summarized in **Table 4.**

J. Estimated sub-EMP Budget

23. The estimated budgets for environmental mitigation and monitoring are summarized in **Table 5.**

K. Mechanisms for Feedback and Adjustment

24. Based on environmental inspection and monitoring reports, the EA PMU with the assistance from the IEC shall decide whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

25. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the sub-EMP will be made, if necessary. The need to

update and adjust the EMP will be reviewed when there are design changes, changes in construction methods and program, negative environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. The EA PMU will inform ADB promptly on any changes to the project and needed adjustments to the sub-EMP. The updated sub-EMP will be submitted to ADB for review and approval, and will be disclosed on the ADB project website.

Table 4: Institutional strengthening and training.

Topic	Attendees	Contents	Frequency	Cost USD
EMP Implementation	EA PMU, IA PIU, subproject contractors	EMP contents, EMP adjustment if needed, prepare CEMPs, roles and responsibilities, monitoring, supervision and reporting procedures	Once prior to project construction	5,000
Grievance Redress Mechanism (GRM)	EA PMU, IA PIU, subproject contractors	GRM procedures; roles and responsibilities		
Environmental Protection	EA PMU, IA PIU, subproject contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)		
Environmental Monitoring Plan (EMoP)	EA PMU, IA PIU, subproject contractors	Monitoring methods, data collection and reporting requirements		
Safety Training	EA PMU, IA PIU, subproject contractors	Traffic safety, construction safety, road safety, occupational safety		

Note: there is one training program covering all 4 subprojects.

Table 5: EMP budget.

EMP Item	Unit	Unit Cost	Estimated Sub-EMP Cost (USD)										Subtotal
			Umnugovi		Uliastai		Govi Altai		Altai Soum		Khovd		
			# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	
Construction Phase													
Mitigation Measures	Cost	-	- - - Included in Construction Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	6	$ 1,500	6	$ 1,500	6	$ 1,500	4	$ 1,000	2	$ 500	$ 6,000
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	$ 5,000
LIEC - National	Monthly Cost	$ 4,000	2	$ 8,000	2	$ 8,000	2	$ 8,000	1	$ 4,000	1	$ 4,000	$ 32,000
Subtotal				*$ 11,000*		*$ 11,000*		*$ 11,000*		*$ 6,500*		*$ 6,000*	***$ 45,500***
Operation Phase													
Mitigation Measures	Annual Cost	-	- - - Included in Operating Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	3	$ 750	3	$ 750	3	$ 750	2	$ 500	2	$ 500	$ 3,250
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
IEC - National	Monthly Cost	$ 4,000	1	$ 4,000	1	$ 4,000	1	$ 4,000	0.5	$ 2,000	0.5	$ 2,000	$ 16,000
Subtotal				*$ 5,750*		*$ 5,750*		*$ 5,750*		*$ 3,500*		*$ 3,500*	***$ 24,250***
TOTAL													***$ 69,750***

Source: ADB PPTA consultants.

APPENDIX V: KHOVD SUBPROJECT ENVIRONMENTAL MANAGEMENT PLAN (SUB-EMP)

A. Introduction

1. The proposed Upscaling Renewable Energy Sector Project in Mongolia. The proposed Project will i) increase renewable energy capacity for electricity and heating supply in remote grid system in western Mongolia; and ii) enhance the capacity of local public utilities in investment planning, project management, and grid control while decarbonizing energy sector in Mongolia.

2. The Project will be implemented over two phases, with the first phase from 2018-2021 and the second from 2019-2023. The first phase includes five subprojects:

Umnugovi:	A 10 MW wind farm will be developed at Namir Bahg, Umnugovi Soum, Uvs Aimag, 100 km southwest of the Uvs aimag capital.
Uliastai:	A 5 MW solar PV farm with battery storage will be developed 23 km west of Uliastai, the capital of Zavkhan Aimag.
Govi Altai:	A 10 MW solar PV farm will be established in Altai City, the capital of Govi Altai Aimag
Altai Soum:	An off-grid 0.5 MW hybrid solar and wind power facility will be developed in Altai soum, located 220 km southwest of Altai City (Yesonbulag Soum), the capital of Govi Altai Aimag.
Khovd:	A Shallow-ground heat pump (GSHP) will be installed at Kindergarten 1 in Khovd City, the capital of Khovd Aimag.

3. A subproject EMP (sub-EMP) has been prepared for each phase I subproject. This is the sub-EMP for the Umnugovi subproject.

B. Objectives

4. The objectives of the sub-EMP are to ensure i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; ii) implementation of monitoring and reporting; and iii) the project compliance with the Mongolia's relevant environmental laws, standards and regulations, and ADB's SPS 2009. Organizational responsibilities and budgets are clearly for execution, monitoring and reporting for pre-construction, construction, operation and decommissioning phases.

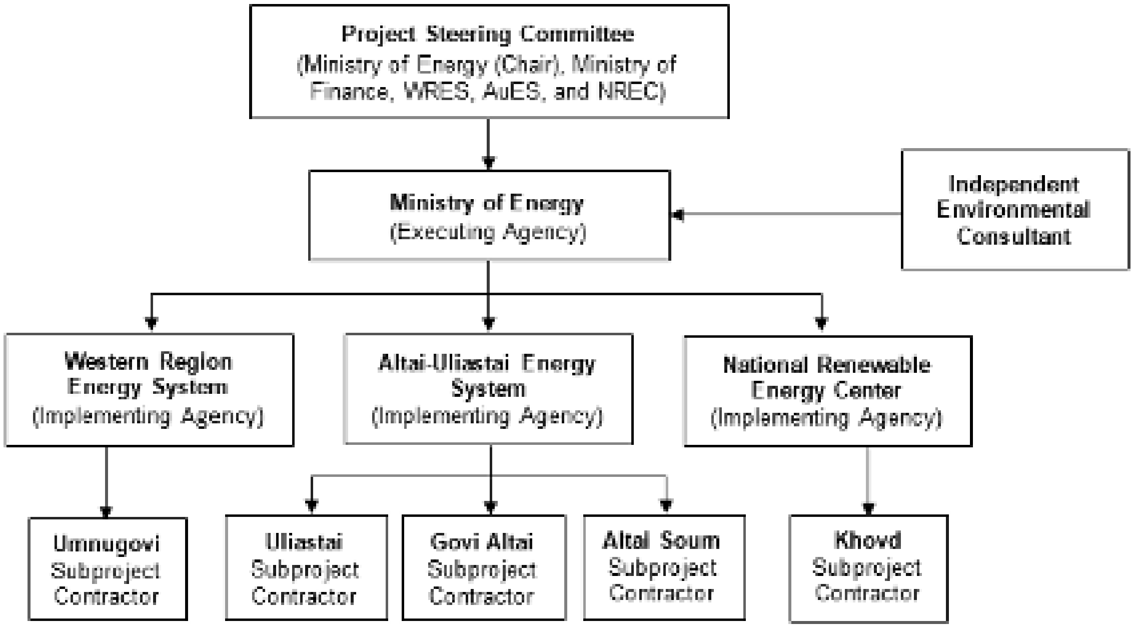
C. Implementation Arrangements

5. The MoE will be the Project EA and NREC will be the IA for GSHP subproject. The IA will have day-to-day responsibility for implementing the subproject.

6. Construction contractors will be responsible for implementing the mitigation measures for each subproject. Contractors will be required to respond to the environmental specifications in the bidding documents in their proposals. Each contractor will also be required to develop a Construction Environmental Management Plan (CEMP) which outlines the way in which they will comply with the EMP, and will assign a person responsible for environment, health and safety. After Project completion, environmental management responsibilities will be handed over to the operation and maintenance units of the IAs.

7. The implementation arrangements for the Project are illustrated in Figure 1.

Figure 1: Project Implementation Arrangements.



D. Responsibilities for EMP Implementation

Steering Committee

8. Chaired by the MoE and including the Ministry of Finance (MoF), WES, AuES, and NREC, the Steering Committee will provide overall guidance to the Project implementation.

Ministry of Energy (MoE)

9. The MoE will be the EA for the project and the primary point of contact with ADB. It will appoint environmental and social safeguards staff to its Project Management Unit (MoE PMU), and will be responsible for overall project planning and management, coordination, and monitoring and supervision. In relation to environment safeguards, the MoE PMU will:

- Have overall responsibility for ensuring the implementation of the EMP.
- Ensure allocation of sufficient budget for EMP implementation and monitoring.
- Ensure compliance with loan assurances, including all the requirements specified in the sub-EMPs.
- Ensure that the necessary environmental clearances and permits are secured for the project.
- Provide coordination and supervision support to the subproject IAs.
- Coordinate resolution of complaints under the GRM.
- Liaise with ADB on the implementation of the sub-EMPs and corrective actions.
- Review the environmental monitoring reports submitted by the subproject IAs.
- Sub
- Incorporate the results of the environmental monitoring reports into progress reports submitted to ADB.

Subproject Implementing Agency (IA)

10. The IA will appoint environmental and social safeguards focal point within the PIU. The IAs will have direct day-to-day responsibility for ensuring the implementation of the sub-EMPs, including:

- Revise the IEE and sub-EMPs as required during detailed design.
- Ensure that national EIA and revised IEE/sub-EMP requirements are included in the bidding documents and civil works contracts.
- Obtain all necessary environmental clearances and permits for the project.
- Coordinating delivery of the training program described in this sub-EMP.
- Require the contractors to develop CEMPs (one for each subproject) in compliance with the sub-EMP, and review and approve CEMPs.
- Ensure the contractors implement the CEMPs properly and in compliance with the requirements of the relevant sub-EMPs.
- Ensure that the contractors comply with the relevant environmental management and protection requirements and regulations of Mongolia and the ADB, and with any Project environmental or social loan covenants and assurances.
- Identify any environmental issues during implementation and propose necessary corrective actions.
- Undertake ongoing outreach and communications with project stakeholders and affected persons (APs).
- Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved.
- Ensure implementation of the environmental monitoring presented in the sub-EMPs environmental monitoring plans.
- Review and consolidate quarterly environmental monitoring reports submitted by the contractors.
- Prepare and submit consolidated semi-annual environmental monitoring reports to MoE PMU for onward submission to ADB.

Subproject Contractors

11. The subproject contractors will be responsible for construction of the Project components, including implementing the relevant sub-EMP mitigation measures. The contractors will also submit quarterly environmental reports to their relevant IA PIU on sub-EMP implementation, and will be required to report any spills, accidents, fires and grievances received and take appropriate action.

Independent Environmental Consultant (IEC)

12. A qualified independent environmental consultant will be recruited to support the EA and IA PIUs in environmental monitoring, reporting, GRM implementation, and delivery of the training program.

Ministry of Environment and Tourism (MoET)

13. The MoET may undertake inspections and monitoring at their discretion.

ADB

14. ADB will conduct environment safeguard due diligence during Project review missions. ADB will review the semi-annual/annual environmental monitoring reports submitted by the EA PMU and will disclose the reports on its website. If the EA PMU fails to meet safeguards requirements described in the sub-EMPs, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

E. Potential Impacts and Mitigation Measures

15. The potential impacts of the subproject during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the EIA). Detailed impacts and mitigation measures are presented in **Table 1.**

16. The mitigation measures will be incorporated into subproject detailed design, bidding documents, construction contracts and operational management manuals. The effectiveness of these measures will be evaluated based on environmental inspections and monitoring to determine whether they should be continued, improved or adjusted.

F. Environment Monitoring Plan

17. An EMoP to monitor the environmental impacts of the subproject and assess the effectiveness of mitigation measures is presented in **Table 2.** The EMoP is focused on compliance inspections undertaken by the IA PIU supported by the IEC. The results will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the subproject implementation; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of sub-EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 1: Khovd subproject EMP.

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
A. Preconstruction Phase					
Detail Design Stage	Environmental Management Readiness	− This sub-EMP will be updated as required and incorporated into the detailed design. − The updated sub-EMP requirements will be incorporated into tender and contract documents. − A detailed assessment of earthquake risks will be undertaken and the result incorporated into the subproject designs as appropriate. − The subproject contractor will develop a subproject CEMP that outline the manner by which they will comply with the requirements of the IEE and sub-EMP. − In accordance with the GRM presented in Chapter VIII of the Project IEE, the EA PMU will be assigned overall responsibility for the GRM; GRM training will be provided for the contractors, EA PMU, subproject IA PIU, and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disseminated at the construction site. − Residents and key stakeholders in will be informed and consulted.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA operations budget
B. Construction Phase					
Surface and Ground Water	Construction and domestic wastewater	Good wastewater practices implemented: − Temporary drainage provision will be provided to ensure that any storm water running off construction areas will be controlled. − Construction sites will be equipped with adequate potable water and temporary sanitation facilities. − Good site management practices, including wastewater management (see above) and management of hazardous and polluting materials (see below) to avoid contamination of thermal wells.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		− Well drilling will be undertaken in accordance with good international practice as noted in the EHS Guidelines for Geothermal Power Generation to minimize the impact of drilling fluids and cuttings. Wells will be grouted and sealed in accordance with international good practice.			
Noise	Impacts on sensitive receptors	Good construction noise management measures, including: − Scheduling construction during school holidays (if practical). − Limiting work to daytime hours. − Using noise barriers if necessary. − Equipping machinery with mufflers in accordance with relevant government requirements.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Equipment Procurement	International transport	It is expected that major equipment will be sourced from outside of Mongolia. Equipment will be required to meet technical specifications including ability to withstand predicted climate changes. Once required technical specifications are met, preference will be given to regional suppliers so as to minimize transport requirements and associated greenhouse gas and other emissions.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Waste	Waste management and resource use	Good waste management practices and the adoption of the waste hierarchy: − The preference is for prevention of waste at source. Procurement options will play a role in waste prevention as the procurement of materials which have less packaging for example, would be preferable. Excavated soil will be used for backfilling to the maximum extent. Waste minimization is the second preferred option. This means the effective management of materials on site through good house-keeping and work planning, in order to generate less waste. Reuse or recycling options should be considered prior to disposal, separate containers for recyclables shall be used if there is a market for the materials. Disposal of waste which cannot be reused or recycled	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility: Implemented By	Responsibility: Supervised By	Source of Funds
		shall take place at sites authorized by authorities. – Storage and containment: Provide appropriate waste storage containers for worker's construction wastes, regularly haul to an approved disposal facility. – General Management: Prohibit burning of waste at all times.			
	Hazardous and polluting materials	Good waste management practices implemented: – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 m from drainage structures, important water bodies and other sensitive receptors. – Storage facilities for hazardous materials will be placed on impermeable surfaces with a storage capacity of at least 110% of the capacity of the hazardous materials stored. – Signs will be placed at chemicals and hazardous materials storage sites to provide information on type and name of chemicals and hazardous materials. – Spill response procedures will be developed (including provision of absorbents at hazardous materials storage facilities), and all spills will be cleaned immediately. – Providers of hazardous materials will be responsible for removing and or recycling them if they become wastes, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained. – Vehicles and equipment will be properly maintained and refueled either off-site in local garages or other similar facilities. Washing or repair of machinery in or near	Subproject Contractor and Suppliers	IA PIU supported by IEC	Included in the constructio n contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		surface waters is prohibited.			
Socio-economic Resources	Traffic Impacts	Good traffic and road management practices: – Transportation routes and delivery schedules planned in consultation with relevant road management authorities. – Any damage caused by construction traffic will be repaired by the subproject contractor. – Vehicles transporting construction materials or wastes will be required to slow down when passing through or nearby sensitive locations.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	Worker Occupational Health and Safety (OHS)	Good construction OHS practices implemented as per the general EHS Guidelines and the EHS Guidelines for Geothermal Power Generation: – All relevant Mongolian safety regulations will be strictly enforced. – All workers will be will be equipped with appropriate personal protective equipment (PPE), such as hard hats, insulating and/or fire resistant clothes, appropriate grounding, hot line and uninsulated tools, safety gloves, safety goggles, fall protection system including safety belts and other climbing gear (for work at heights), ear protection, etc. PPE will be maintained and replaced as necessary. – All work at height will be prohibited during non-daylight hours, during periods of fog, and during periods of strong wind. – Construction sites will be equipped with adequate potable water and temporary sanitation facilities. – Training will be provided to workers in all aspects of OHS, including prevention of communicable diseases (including HIV/AIDS) prior to the start of construction and on a regular basis (e.g. monthly briefings). Emergency Response Procedures (ERP): – Emergency response procedures will be developed, including	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. – Medical emergency response procedures will be developed covering both workers and community members (when affected by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emerge response, protocols for informing and transferring injured workers to local or provincial health centers, and record keeping. At least one trained first-aid worker will be available at the construction site. – Training will be provided to workers in all aspects of the ERP.			
	Community health and safety risks	Good community health and safety practices, including: − Outreach to local communities to disseminate knowledge about safety at or near the construction sites, installation of site safety fencing and warning signs (in Mongolian language). − On site supervision personal (including night guards), as determined by the risk, to prevent unauthorized access to construction areas. − Signs will be placed at construction site in clear view of the public to avoid public access to the site.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
	PCRs	If any chance finds of PCRs are encountered: − construction activities will be immediately suspended; − destroying, damaging, defacing, or concealing PCRs will be strictly			

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
		prohibited in accordance with Mongolian regulations; − the local Cultural Heritage Bureau will be promptly informed and consulted; and, − construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau.			
C. Operation Phase					
Water	Groundwater Impacts Groundwater Contamination	− A closed loop system will be used (no groundwater withdrawal or disposal). − To avoid potential groundwater contamination the wells will be sealed with a thermally conductive bentonite grout. − Monopropylene glycol will be used as the antifreeze.	Subproject Contractor	IA PIU supported by IEC	Included in the construction contract
Refrigerant	Ozone Depletion	− The Khovd GSHP will utilize environmentally friendly refrigerants such as R290 or R32, both of which have a low global warming potential (GWP), and a zero Ozone Depleting Potential (ODP).	Subproject Operator	EA	Subproject operating budget
Waste	Solid and Hazardous Wastes	− Domestic wastes will be collected and disposed at approved local waste disposal site. − Equipment that requires replacement will be recycled by the equipment provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − Wastes that are considered hazardous will be disposed by the provider, either in Mongolia in licensed facilities, or through transport to a licensed facility in another country in the region. − All exports of hazardous wastes must be with the review and approval of the MoET, and all necessary export licenses must be obtained.	Subproject Operator	EA	Subproject operating budget

Item	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented By	Supervised By	
Climate Risk	Adaptation to observed and Projected Climate Change	– A solar collector will be used to re-charge the ground loop by solar heating during the summer, which will improve the efficiency of the GSHP and prolong the geological age of the thermal well.	EA PMU and subproject IA PIU	EA and ADB	Included in EA and subproject IA design and construction budgets

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

Table 2: Khovd subproject EMoP.

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Pre-construction Phase						
Air Pollution	Dust/particulates	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Noise	Noise level	Construction sites	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
Well Water	Quality	Nearest 2 wells	Once before construction commences	IA PIU or a third part monitoring company contracted by IA PIU	PMU, local environmental authority at its discretion	IA PIU: IA Budget
B. Construction Phase						
Surface and Groundwater	Visual compliance inspection of wastewater mitigation measures.	Construction sites	Monthly during construction of tower bases near rivers	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
Noise	Compliance inspection of noise control measures	Construction sites in urban areas and near sensitive receptors	Twice during each construction season: once during daytime, once during nighttime.	3rd party certified environmental monitoring firm	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Hazardous and Polluting Materials	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
Socioeconomic Impacts	Visual inspection of construction site to check construction site safety, community safety, implementation of GRM, accidents involving public and workers, public complaints, etc.	Working sites near sensitive receptors	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget
	All near miss, no lost time, lost time and fatal accidents recorded and reported against a performance standard of zero incidents	Construction sites	Monthly	IA PIU environmental and social staff, supported by IEC	PMU, local environmental authority at its discretion	IA PIU: IA Budget IEC: IEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
	Compliance inspection to determine workers have appropriate PPE	All construction sites	Monthly	PMU environmental and social staff supported by IEC	PMU, local environmental authority at its discretion	PMU SS: PMU Budget IEC: LICE Budget
C. Operation Phase						
Solid and Hazardous Wastes	Compliance inspection of hazardous materials management and recycling.	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Annually	IA	EA, local environmental authority and MoET at their discretion	IA operating budget

Note: ADB = Asian Development Bank; EA = Executing Agency; IA = Implementing Agency; PMU = Project Management Unit.

G. Performance Indicators

30. Performance indicators (**Table 3**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

Table 3: Performance Indicators

No.	Description	Indicators
1	Staffing	(i) EA PMU and IA PIUs established with appropriately qualified staff. (ii) IA PIUs designated with appropriately qualified staff. (iii) Appropriately qualified LEC recruited. (iv) 3rd party environmental monitoring station/company engaged if needed.
2	Budgeting	(xiii) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (xiv) Environment monitoring cost is sufficiently and timely allocated. (xv) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	(ix) Compliance monitoring is conducted by EA PMU, IA PIUs, and LEC per EMoP. (x) Pre-construction ambient and noise monitoring is conducted by IA PIUs or 3rd party environmental monitoring companies.
4	Supervision	(ix) ADB mission to review EMP implementation at least once a year during the construction phase.

No.	Description	Indicators
		(x) Local environmental authorities to supervise monitoring at their discretion.
5	Reporting	(ix) Semi-annual (during construction period) and annual (during operation) subproject specific environmental monitoring reports prepared by EA PMU with the support of LEC. (x) Semi-annual (during construction period) and annual (during operation) environmental monitoring reports are submitted to ADB.
6	Capacity Building	(xiii) Construction Environmental Management Plans are developed and in place before substantive construction activities begin. (xiv) Training on Construction Environmental Management Plans, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of subproject implementation. (xv) Training on EMP implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	(ix) GRM contact persons are designated at EA PMU and IA PIUs, and GRM contact information disclosed to the public before construction. (x) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with Mongolian standards	(v) Project complies with the Mongolian environmental laws and regulations and meets all required standards.

H. Environment Reporting

18. The environmental reporting requirements during the implementation of the project are summarized in the **Table 3**.

Internal Reporting

19. During construction periods the subproject contractor will be responsible for conducting internal reporting on construction activities, including compliance with the EMP. Results will be reported through quarterly reports to the IA PIU.

20. The IA PIU will submit semi-annual reports to the EA PMU on sub-EMP implementation based on subproject contractor internal reporting and the results of compliance inspection monitoring.

Reporting to ADB

21. The EA PMU with support from the IEC will submit environmental monitoring reports semi-annually during construction and annually during operation on sub-EMP implementation to the ADB. The semi-annual environmental monitoring reports will include (i) progress made in sub-EMP implementation; (ii) overall effectiveness of the sub-EMP implementation (including public and occupational health and safety); (iii) environmental monitoring and compliance; (iv) institutional strengthening and training; (v) public consultation, information disclosure and GRM; and (vi) any problems encountered during construction and operation, and the relevant corrective actions undertaken. ADB will disclose the English version of the reports on its website. An environmental monitoring report template is presented in **Appendix IX** of the IEE.

I. Training and Capacity Building

22. To ensure effective implementation of the sub-EMP, the capacity of the EA PMU and IA PIUs and contractors will be strengthened. The main training emphasis will be to ensure that the contractors, IA PIU and EA PMU are well versed in environmentally sound practices and are able to undertake all construction and operation with the appropriate environmental safeguards. The training will focus on both construction and operation phases of the project. The training program is summarized in **Table 4.**

J. Estimated sub-EMP Budget

23. The estimated budgets for environmental mitigation and monitoring are summarized in **Table 5.**

K. Mechanisms for Feedback and Adjustment

24. Based on environmental inspection and monitoring reports, the EA PMU with the assistance from the IEC shall decide whether (i) further mitigation measures are required as corrective actions, or (ii) some improvements are required for environmental management practices.

25. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. Adjustment to the sub-EMP will be made, if necessary. The need to update and adjust the EMP will be reviewed when there are design changes, changes in construction methods and program, negative environmental monitoring results or inappropriate monitoring locations, and ineffective or inadequate mitigation measures. The EA PMU will inform ADB promptly on any changes to the project and needed adjustments to the sub-EMP. The updated sub-EMP will be submitted to ADB for review and approval, and will be disclosed on the ADB project website.

Table 4: Institutional strengthening and training.

Topic	Attendees	Contents	Frequency	Cost USD
EMP Implementation	EA PMU, IA PIU, subproject contractors	EMP contents, EMP adjustment if needed, prepare CEMPs, roles and responsibilities, monitoring, supervision and reporting procedures	Once prior to project construction	5,000
Grievance Redress Mechanism (GRM)	EA PMU, IA PIU, subproject contractors	GRM procedures; roles and responsibilities		
Environmental Protection	EA PMU, IA PIU, subproject contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)		
Environmental Monitoring Plan (EMoP)	EA PMU, IA PIU, subproject contractors	Monitoring methods, data collection and reporting requirements		
Safety Training	EA PMU, IA PIU, subproject contractors	Traffic safety, construction safety, road safety, occupational safety		

Note: there is one training program covering all 4 subprojects.

Table 5: EMP budget.

EMP Item	Unit	Unit Cost	Estimated Sub-EMP Cost (USD)										Subtotal
			Umnugovi		Uliastai		Govi Altai		Altai Soum		Khovd		
			# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	# Units	Cost	
Construction Phase													
Mitigation Measures	Cost	-	- - - Included in Construction Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	6	$ 1,500	6	$ 1,500	6	$ 1,500	4	$ 1,000	2	$ 500	$ 6,000
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	2	$ 1,000	$ 5,000
LIEC - National	Monthly Cost	$ 4,000	2	$ 8,000	2	$ 8,000	2	$ 8,000	1	$ 4,000	1	$ 4,000	$ 32,000
Subtotal				*$ 11,000*		*$ 11,000*		*$ 11,000*		*$ 6,500*		*$ 6,000*	***$ 45,500***
Operation Phase													
Mitigation Measures	Annual Cost	-	- - - Included in Operating Costs - - -										
Inspection & Monitoring	Monthly Cost	$ 250	3	$ 750	3	$ 750	3	$ 750	2	$ 500	2	$ 500	$ 3,250
Training	Program Cost	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
Public Consultation	Costs	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	1	$ 500	$ 2,500
IEC - National	Monthly Cost	$ 4,000	1	$ 4,000	1	$ 4,000	1	$ 4,000	0.5	$ 2,000	0.5	$ 2,000	$ 16,000
Subtotal				*$ 5,750*		*$ 5,750*		*$ 5,750*		*$ 3,500*		*$ 3,500*	***$ 24,250***
TOTAL													***$ 69,750***

Source: ADB PPTA consultants.

APPENDIX VI: DEIA APPROVAL

1. Altai Soum – Off-grid 0.5 MW hybrid solar and wind power facility

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ
ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН,
АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ГОВЬ-АЛТАЙ АЙМГИЙН АЛТАЙ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "НАР-САЛХИНЫ ХОСОЛСОН ГИБРИД СТАНЦ"ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН
ЗАХИРАЛ

/Т. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН
ЕРӨНХИЙ ЗАХИРАЛ

/П.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ГОВЬ-АЛТАЙ АЙМГИЙН АЛТАЙ
СУМЫН ЗАСАГ ДАРГА

/ Д.ЦЭРЭВСАМБУУ/

УЛААНБААТАР ХОТ
2018 ОН

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮГМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ГОВЬ-АЛТАЙ АЙМГИЙН АЛТАЙ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "НАР-САЛХИНЫ ХОСОЛСОН ГИБРИД СТАНЦ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ МЕНЕЖМЕНТИЙН ТӨЛӨВЛӨГӨӨ

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ГОВЬ-АЛТАЙ АЙМГИЙН АЛТАЙ СУМЫН ЗАСАГ ДАРГА

/ Д.ЦЭРЭВСАМБУУ/

УЛААНБААТАР ХОТ
2018 ОН

English Translation:

APPROVED BY: GENERAL EXPERT OF *signed*

MINISTRY OF ENVIRONMENT AND TOURISM *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

REPORT ON DETAILED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE "WIND-SOLAR HYBRID SYSTEM" PROJECT IN ALTAI SOUM, GOVI-ALTAI AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF "MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT IMPLEMENTING SITES:
GOVERNOR OF ALTAI SOUM, GOVI-ALTAI AIMAG

signature
stamp

/D.TSEREVSAMBUU/

ULAANBAATAR CITY,
2018

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

ENVIRONMENTAL MANAGEMENT PLAN FOR THE "WIND-SOLAR HYBRID SYSTEM" PROJECT IN ALTAI SOUM, GOVI-ALTAI AIMAG

ASSESSMENT PERFORMED BY:

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sealed

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BODY REPRESENTING THE PROJECT IMPLEMENTING SITES:
GOVERNOR OF ALTAI SOUM,
GOVI-ALTAI AIMAG

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC
signed
sealed

/L.ERDENEDALAI/

signature
stamp
/D.TSEREVSAMBUU/

ULAANBAATAR CITY,
2018

2. Khovd - 100 kW Shallow-ground heat pump

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ
ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН,
АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ХОВД АЙМГИЙН ЖАРГАЛАНТ СУМЫН НУТАГТ "ГАЗРЫН ГҮНИЙ ДУЛААН АШИГЛАЖ ДУЛААН ХАНГАМЖ САЙЖРУУЛАХ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР

ХОВД АЙМГИЙН ЖАРГАЛАНТ СУМЫН ЗАСАГ ДАРГА

УЛААНБААТАР ХОТ
2018 ОН

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ХОВД АЙМГИЙН ЖАРГАЛАНТ СУМЫН НУТАГТ "ГАЗРЫН ГҮНИЙ ДУЛААН АШИГЛАЖ ДУЛААН ХАНГАМЖ САЙЖРУУЛАХ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ МЕНЕЖМЕНТИЙН ТӨЛӨВЛӨГӨӨ

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ХОВД АЙМГИЙН ЖАРГАЛАНТ СУМЫН ЗАСАГ ДАРГА

/[illegible]/

УЛААНБААТАР ХОТ
2018 ОН

English translation:

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

REPORT ON DETAILED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE "SHALLOW-GROUND HEAT PUMP" PROJECT IN JARGALANT SOUM, KHOVD AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF "MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT IMPLEMENTING SITES:
GOVERNOR OF JARGALANT SOUM, KHOVD AIMAG

signature
stamp

/TS.GANDANPOVRON/

ULAANBAATAR CITY,
2018

APPROVED BY: GENERAL EXPERT OF MINISTRY OF ENVIRONMENT AND TOURISM *signed sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF MINISTRY OF ENVIRONMENT AND TOURISM *signed*

ENVIRONMENTAL MANAGEMENT PLAN FOR THE "SHALLOW-GROUND HEAT PUMP" PROJECT IN JARGALANT SOUM, KHOVD AIMAG

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PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF "MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

signature
stamp

/TS.GANDANPOVRON/

ULAANBAATAR CITY,
2018

3. Uliastai - 5 MW solar PV farm

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ЗАВХАН АЙМГИЙН АЛДАРХААН СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "5 МВт НАРНЫ ЦАХИЛГААН СТАНЦ"ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭРЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ЗАВХАН АЙМГИЙН АЛДАРХААН СУМЫН ЗАСАГ ДАРГА

/Б.БАТДЭЛГЭР /

УЛААНБААТАР ХОТ
2018 ОН

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ
ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН,
АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ЗАВХАН АЙМГИЙН АЛДАРХААН СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "5 МВт НАРНЫ ЦАХИЛГААН СТАНЦ " ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ МЕНЕЖМЕНТИЙН ТӨЛӨВЛӨГӨӨ

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ЗАВХАН АЙМГИЙН АЛДАРХААН СУМЫН ЗАСАГ ДАРГА

/Б.БАТДЭЛГЭР/

УЛААНБААТАР ХОТ
2018 ОН

English Translation:

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

REPORT ON DETAILED ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE "5 MW SOLAR PV STATION" PROJECT IN
ALDARKHAAN SOUM/ ULIASTAI, ZAVKHAN AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT
IMPLEMENTING SITES:
GOVERNOR OF ALDARKHAAN SOUM,
ZAVKHAN AIMAG

signature
stamp

/B.BATDELGER/

ULAANBAATAR CITY,
2018

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

ENVIRONMENTAL MANAGEMENT PLAN
FOR THE "5 MW SOLAR PV STATION" PROJECT IN
ALDARKHAAN SOUM/ ULIASTAI, ZAVKHAN AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

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sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

/B.BATDELGER/

BODY REPRESENTING THE PROJECT
IMPLEMENTING SITES:
GOVERNOR OF ALDARKHAAN SOUM,
ZAVKHAN AIMAG

signature
stamp

ULAANBAATAR CITY,
2018

4. Umnugovi - 10 MW wind farm

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.[illegible]ДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

УВС АЙМГИЙН ӨМНӨГОВЬ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "10 МВт САЛХИН ЦАХИЛГААН СТАНЦ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г.СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

УВС АЙМГИЙН ӨМНӨГОВЬ СУМЫН ЗАСАГ ДАРГА

/Р.ТӨМӨРЧӨДӨР/

УЛААНБААТАР ХОТ
2018 ОН

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

УВС АЙМГИЙН ӨМНӨГОВЬ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "10 МВт САЛХИН ЦАХИЛГААН СТАНЦ " ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ МЕНЕЖМЕНТИЙН ТӨЛӨВЛӨГӨӨ

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Д.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

УВС АЙМГИЙН ӨМНӨГОВЬ СУМЫН ЗАСАГ ДАРГА

/Р.ТӨМӨРЧӨДӨР/

УЛААНБААТАР ХОТ
2018 ОН

English translation:

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

REPORT ON DETAILED ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE "10 MW WIND STATION" PROJECT IN
UMNOGOVI SOUM, UVS AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT IMPLEMENTING SITES:
GOVERNOR OF UMNOGOVI SOUM, UVS AIMAG

signature
stamp

/R.TUMURCHUDUR/

ULAANBAATAR CITY,
2018

APPROVED BY: GENERAL EXPERT OF *signed*
MINISTRY OF ENVIRONMENT AND TOURISM *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

ENVIRONMENTAL MANAGEMENT PLAN
FOR THE "10 MW WIND STATION" PROJECT IN
UMNOGOVI SOUM, UVS AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

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GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT
IMPLEMENTING SITES:
GOVERNOR OF UMNOGOVI SOUM, UVS
AIMAG

signature
stamp

/R.TUMURCHUDUR/

ULAANBAATAR CITY,
2018

5. Gobi-Altai – 10 MW solar PV farm

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН, АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ Б. Батбаяр.

ГОВЬ-АЛТАЙ АЙМГИЙН ЕСӨН-БУЛАГ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "10МВт НАРНЫ ЦАХИЛГААН СТАНЦ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ ТАЙЛАН

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

"МОН-ЭНЕРЖИ КОНСАЛТ" ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ГОВЬ-АЛТАЙ АЙМГИЙН ЕСӨНБУЛАГ СУМЫН ЗАСАГ ДАРГА

/Ш.ДАГВА/

УЛААНБААТАР ХОТ
2018 ОН

БАТЛАВ: БАЙГАЛЬ ОРЧИН, АЯЛАЛ
ЖУУЛЧЛАЛЫН ЯАМНЫ ЕРӨНХИЙ ШИНЖЭЭЧ Г.НЯМДАВАА

ШҮҮМЖ ХИЙСЭН: БАЙГАЛЬ ОРЧИН,
АЯЛАЛ ЖУУЛЧЛАЛЫН ЯАМНЫ ШИНЖЭЭЧ

ГОВЬ-АЛТАЙ АЙМГИЙН ЕСӨН-БУЛАГ СУМЫН НУТАГ ДЭВСГЭРТ БАРИХ "10МВт НАРНЫ ЦАХИЛГААН СТАНЦ" ТӨСЛИЙН БАЙГАЛЬ ОРЧНЫ МЕНЕЖМЕНТИЙН ТӨЛӨВЛӨГӨӨ

ҮНЭЛГЭЭ ХИЙСЭН МЭРГЭЖЛИЙН
БАЙГУУЛЛАГА:

"САННИ ТРЕЙД" ХХК-ИЙН
ЗАХИРАЛ

/Г. СЭЛЭНГЭ/

ТӨСӨЛ ХЭРЭГЖҮҮЛЭГЧ:

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ХХК-ИЙН ЕРӨНХИЙ ЗАХИРАЛ

/Л.ЭРДЭНЭДАЛАЙ/

ТӨСӨЛ ХЭРЭГЖИХ НУТАГ ДЭВСГЭР:

ГОВЬ-АЛТАЙ АЙМГИЙН ЕСӨНБУЛАГ
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/Л.ДАГВА/

УЛААНБААТАР ХОТ
2018 ОН

English Translation:

APPROVED BY: GENERAL EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed* *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

REPORT ON DETAILED ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE "10 MW SOLAR PV STATION" PROJECT IN
YESENBULAG SOUM, GOVI-ALTAI AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT
IMPLEMENTING SITES:
GOVERNOR OF YESENBULAG SOUM, GOVI-
ALTAI AIMAG

signature
stamp

/SH.DAGVA/

ULAANBAATAR CITY,
2018

APPROVED BY: GENERAL EXPERT OF *signed*
MINISTRY OF ENVIRONMENT AND TOURISM *sealed* **G.NYAMDAVAA**

REVIEWED BY: EXPERT OF
MINISTRY OF ENVIRONMENT AND TOURISM *signed*

ENVIRONMENTAL MANAGEMENT PLAN
FOR THE "10 MW SOLAR PV STATION" PROJECT IN
YESENBULAG SOUM, GOVI-ALTAI AIMAG

ASSESSMENT PERFORMED BY:

DIRECTOR OF "SUNNY TRADE" LLC

signed
sealed

/G.SELENGE/

PROJECT PRESENTER/ IMPLEMENTOR:

GENERAL DIRECTOR OF
"MON-ENERGY CONSULT" LLC

signed
sealed

/L.ERDENEDALAI/

BODY REPRESENTING THE PROJECT IMPLEMENTING SITES:
GOVERNOR OF YESENBULAG SOUM, GOVI-ALTAI AIMAG
signature
stamp

/SH.DAGVA/

ULAANBAATAR CITY,
2018

APPENDIX VII: LETTERS FROM UMNUGOVI SOUM GOVERNOR AND UMNUGOVI SOUM STATE ENVIRONMENTAL INSPECTORATE WITH RESPECT TO UVSIIN KHAR US LAKE

Original Letters

УВС АЙМАГ
ӨМНӨГОВЬ СУМЫН
ЗАСАГ ДАРГА

213410, [illegible], Өмнөговь сум

2007.12.20 № 247

танай ________ -ны № ________ -т

АЗИЙН ХӨГЖЛИЙН
БАНКИНД

Манай сумын төвөөс 18км-т байрлах Хар ус нуурт загас, жараахай байдаггүй. Хужир, мараа шингээсэн булингар устай учир усны шувууд ирдэггүй, дайран өнгөрдөггүй болно.

Байгаль орчны улсын байцаагчийн дүгнэлт хавсаргав.

ДАРГА Р.ТӨМӨРЧӨДӨР

АЗИЙН ХӨГЖЛИЙН БАНКИНД

[illegible]
УЛСЫН БАЙЦААГЧИЙН ДҮГНЭЛТ
Увс аймаг, Өмнөговь сум
Утас [illegible]
Утас/факс [illegible]
2017.12.20 № 01
танай ___ -ны № ___ -т

Тодорхойлолт

Увс аймгийн Өмнөговь сумын Хар-Ус нуурын цутгал гол нь Намирын гол юм. Намирын гол нь Хархираа Түргэний уулсаас эх авах Орлогын гол болон Намирын хөндийгөөр урсаждаа шавартаг хужир марав шингээн булингар болж Хар-Ус нуурт цутгадаг.

Эдгээр хүчин зүйлийн улмаас тухайн нууранд загас жараахай байдаггүй. Усны шувуудын хоол болох нялцгай болон бичил биетэн маш ядмаг учраас шувуудын данжин өнгөрөх нутаг болдоггүй.

Газарзүйн байрлалын хувьд Увс нуураас 150 км, Хяргас нуураас 90 км, Ховд аймгийн Хар-Ус нуураас 150 км зай байдаг.

Байгаль хамгаалагчаар А.Намсурэн 1990-2003 он хүртэл, Н.Сүрэнхорлоо 2003 оноос одоог хүртэл, Байгаль орчны хяналтын улсын байцаагчаар Г.Хүрлээ 2004-2012 он хүртэл, Ц.Лхамжав 2012 оноос одоог хүртэл тус ажилласан бөгөөд нийт 27 жилийн хугацаанд байгаль орчны тайланд усны шувуудын талаар мэдээ байхгүй байгаа нь Хар-Ус нуурыг усны шувууд дайран өнгөрөх болон шилждэггүй нутаг болохыг нотолж байна.

БАЙГАЛЬ ОРЧНЫ
ХЯНАЛТЫН УЛСЫН БАЙЦААГЧ Ц.ЛХАМЖАВ

Translations

Letterhead
(State Logo of Mongolia)

Governor of Umnugovi Soum of Uvs Aimag
Address: 213410, Namir, Umnugovi soum

Date: 20 December 2017. Ref. No. 247

To: Asian Development Bank

There are no fish in Khar-Us Lake of Uvs aimag, located 18 km from our Soum center. The water /traveling/ birds do not come and pass through this lake.

Find the attached herewith a Report of the State Environment Inspector.

Soum Governor /signed and sealed/ R. Tumurchudur

Mongolian Agency for Professional Inspection and Control

REPORT OF STATE INSPECTOR
Umnugovi soum, Uvs aimag
Telephone: 91209293
Telephone/Fax: (01452) 7045-6204
2017.12.20 № 01 .

Reference:
TO ASIAN DEVELOPMENT BANK

Namir River is the inflow of Khar Us Lake in Umnugovi soum, Uvs aimag. The Namir River begins in the Kharkhiraa and Turgen mountains and after flowing across Orlogiin River and Namir valley, where it dissolves clay and salt, its turbid water flows into Khar Us Lake.

Because of these factors there are no fish in the lake. The lake is poor with mollusks and microorganisms, which are the main food of water birds, therefore the lake is not a transit area for birds.

Its geographic location is 150 km from Uvs lake, 90 km from Khyargas lake and 150 km from Khar Us lake of Khovd aimag.

As an Environmental Protector Nyamsuren A. worked between 1990 and 2000 and Surenkhorloo N. worked since 2000, and as a State Inspector Of Environmental Control Khurlee G. worked between 2004 and 2012 and Lhamjav Ts. Worked since 2012, and there was no information about water birds in the environmental reports of 27 years. Therefore, this proves that the Khar Us Lake is not an area where water birds transit or live.

STATE INSPECTOR OF
ENVIRONMENTAL CONTROL signature LHAMJAV TS.

Note: the above letters refer to “Khar Us Lake” which in the IEE is referred to as “Uvsiin Khar Us Lake” so as to avoid confusion with the much larger Khar Us Lake, almost 80 km to the south at the two nearest points.

APPENDIX VIII: PUBLIC CONSULTATION RECORDS

Umnugovi 10 MW Wind

Table 1: Original list of participants of a consultation meeting on environmental and social impact assessment of a proposed 10 MW wind power station, Namir Bahg, Umnugovi Soum, Uvs Aimag, October 18th, 2017.

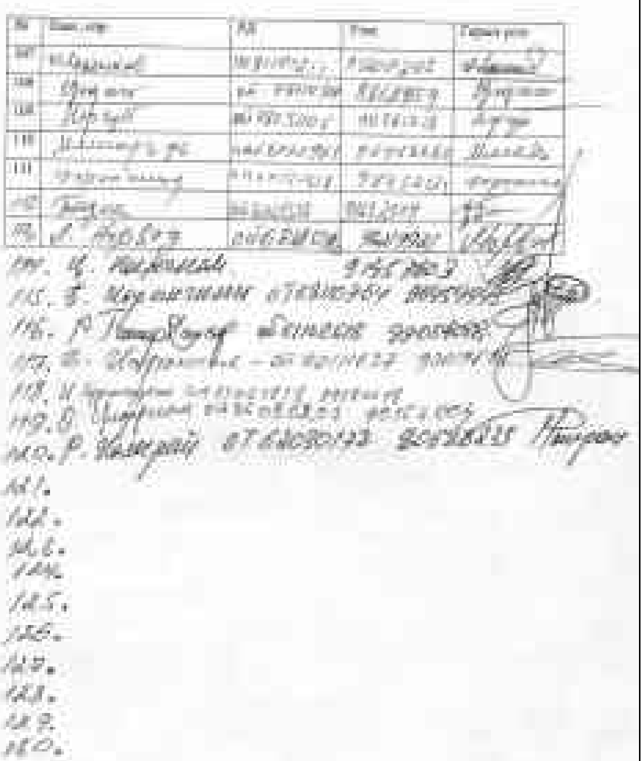


Table 2: Translation of list of participants of a consultation meeting on environmental and social impact assessment of a proposed 10 MW wind power station, Namir Bahg, Umnugovi Soum, Uvs Aimag, October 18th, 2017.

No.	Last name, Given name	Personal No.		No.	Last name, Given name	Personal No.
1	B. Oyunbileg	OI 72120805		61	D. Gankhuyag	OI 84090511
2	B. Lhagvajav	OI90070404		62	Sainbuyan	OI 82111733
3	E. Ariuntsetseg	OI 89122804		63	Yanjmaa	OI 53020006
4	D. Erdenechimeg	OI 90091105		64	Dari	
5	D. Togtokh	OI 86012645		65	Ts. Banzragch	OI 88042015
6	S. Zolzaya	OI 88052217		66	J. Otgonjargal	OI 87100614
7	B. Sukhbaatar	OI60030119		67	O. Duurenjargal	OI 86062418
8	B. Oyuntsetseg	OI 59011604		68	M. Darisuren	OI 86091601
9	Nyamgerel	OI 69090706		69	O. Enkhtuya	OP 88041606
10	B. Gereltod…	OI 63062218		70	Ch. Ryenchinsambuu	OI 87080314
11	U. Ichinkhorloo	OI 55091218		71	S. Budgerel	OI 88102601
12	Kh. Mungun	OI 53041506		72	B. Erdenetsetseg	OI 88112402
13	D. Nyamseren	OI 57120803		73	S. Pagma	OI 83050509
14	N. Oyundelger	EO 62041608		74	A. Bayarsaikhan	OI 67062009
15	Gantulga	TO 82030998		75	O. Khankhuukhen	OI 60110500
16	Baasanjav	OI 81082911		76	Sh. Altangerel	OI 71100617
17	R. Davaadorj	OI 74071111		77	Ts. Ragchaasuren	OI 82061213
18	N. Surenkhorloo	OI 84092334		78	L. Bayarsaikhan…	OE 75080314
19	Ts. Purevsuren	OI 59120411		79	S. Javkhlantugs	OI 80111611
20	T. Nyamsuren	OI 66011813		No.	Last name, Given name	Personal No.
21	J. Darisuren	OYu 85112362		80	Sh. Bayanbat	OI 68122611
22	N. Togtokhjargal	OE 60011311		81	N. Byambajav	OYu 80060774
23	J. Lhagvasuren	OI 77020911		82	S. Lhagvasambuu	OI 70020318
24	D. Sodnomdorj	OP 77080170		83	M. Otgonnyam	OI 70052504
25	R. Batsukh	OI 42020652		84	B. Erdene	OI 68010114
26	G. Khurlee	OI 44120517		85	B. Oyun	OI 77062026
27	Ts. Taivankhuu	OT 62063077		86	Buyankhishig	OI 69092018
28	B. Tsevegmid.	OD 63091610		87	B. Dolgorsuren	OI 88010188
29	Ts. Tserendulam	OI 75042806		88	G. Battur	OI 83022617
30	Ch. Sainjargal	OI 61062018		89	Mendbuyan	BYu 70011911
31	N. Tseveenjav	OI 63010608		90	Davaakhuu	OB 65030312
32	Z. Enkhtuya	OM 82083101		91	Yanjmaa	OI 85101206
33	N. Badamgarav	OI 84121302		92	Erdenechimeg	OB 66022106
34	B. Uyanga	OP 87052101		93	O. Khartolgoi	
35	Ts. Tserenjav	OI 70041002		94	Lhagvasuren	OI74112834
No.	Last name, Given name	Personal No.		95	Shirnen	
36	Sh. Nemekhjargal	KhO 71060105		96	P. Natsagnyam	

No.	Last name, Given name	Personal No.		No.	Last name, Given name	Personal No.
37	S. Chimed			97	D. Gantulga	OI 84050030
38	Ts. Munkhtuul	OI 83090605		98	S. Munkhtsetseg	OT 89032769
39	A. Gantuya	OI 88030427		99	D. Mungunkhuyag	OI 72081019
40	B. Badam	OI 84070401		100	Z. Zorig	ShJ 64011173
41	D. Yanjindulam	OI 79041605		101	D. Sodnomdorj	OL 77080170
42	B. Oyunchimeg	OO 89041546		102	J. Munkhbayar	
43	B. Ulziisuren	OI 64122318		103	Galsansanjaa	OI 80022114
44	I. Gansukh	OI 83100612		104	N. Buyankhishig	OI 77121515
45	J. Rentsensambuu	OI74061511		105	Z. Batnasan	OI 73041015
46	R. Gungesuren	OI 63111136		106	Gankhuyag	OI 70042815
47	N. Erdene-Oyu	OI 00070815		107	Ts. Lhamjav	US 81101211
48	Ts. Gantsagaan	980092617		108	Tsetsegee	OI 78110304
49	Ts. Altantuul	OI 83092432		109	Nergui	OI 78031106
50	Ts. Bayarsaikhan	OI 86050203		110	Myagmardari	TsA 68060961
51	G. Badamdorj	IYu 69012535		111	Tserenjid	OP 64120518
52	Sh. Ragchaasuren	OI 72040815		112	Gantulga	OI 8001315
53	I. Moriya	OI 70102504		113	L. Nerzed	OI68120410
54	B. Dashkhurel	OI 78070717		114	Ts. Natsagnyam	
55	S. Ulzii	OI 62120139		115	B. Naranchimeg	OT 68110764
56	D. Densmaa	DYu 70053069		116	R. Tumurchudur	OI 81102618
57	B. Nyamjav..	OI 63111807		117	B. Tserenpil	OI 72111037
58	Odontsetseg	OI 60022018		118	I. Surenkhorloo	OP 71061818
59	Ts. Gantumur	OYu 70040911		119	U. Undarmaa	OI 85030203
60	B. Tsedenbal	EI 90051819		120	R. Namsrai	OT 62030178

Figure 1: Decision of the Namir Bahg's Peoples Khural of Umnugovi Soum, Uvs Aimag, supporting the subproject's environmental impact assessment and translation.

Symbol

PEOPLES KHURAL'S RESOLUTION OF 5TH BAG
UMNUGOVI SOUM, UVS AIMAG

2017 year 10 month 18 day No. 11 Namir

About assessment report

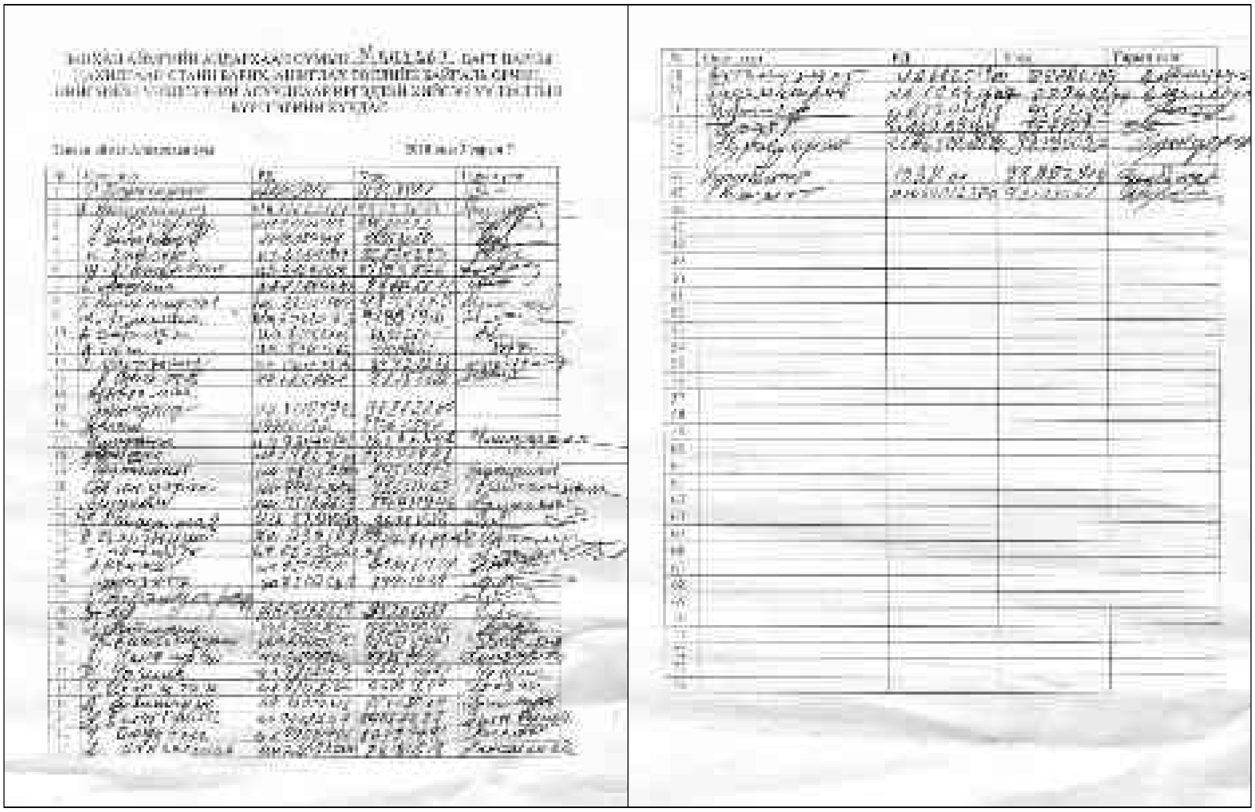
Based on the Article 17.1.9 of Law of Mongolia on administrative and territorial units of Mongolia and their governance, Article 18.4 of Law of Mongolia on environmental impact assessments, Bahg's Peoples Khural has discussed and RESOLVED:

1. Support the "Sunny Trade" LLC's "Report of specified environmental assessment" of Wind driven electric power station project, which is financed by Asian Development Bank and will be built in territory Namir Bahg, Umnugovi soum.

2. Support the project to the Ministry of Environment and Tourism.

Uliastai 5 MW Solar PV with Battery Storage

Table 1: Original list of participants of a consultation meeting on environmental and social impact assessment of a proposed 5 MW solar power station with battery storage, Mandaat Bag, Aldarkhaan Soum, Zavkhan Aimag, March 7^{th}, 2018.



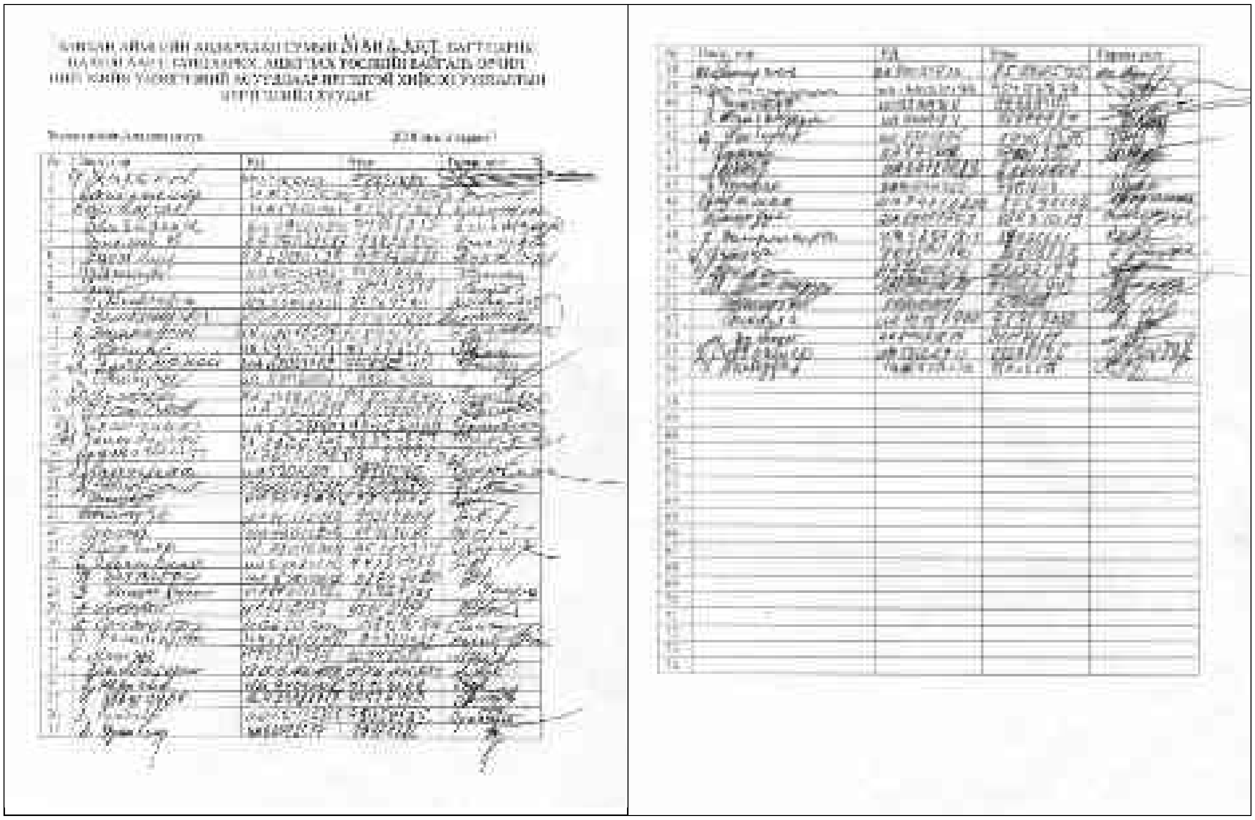


Figure 1: Decision of the Mandaat Bahg's Peoples Khural of Aldarkhaan Soum, Zavkhan Aimag, supporting the subproject's environmental impact assessment and translation.

ЗАВХАН АЙМГИЙН
АЛДАРХААН СУМЫН МАНДААТ БАГИЙН ИРГЭДИЙН
НИЙТИЙН ХУРЛЫН ТОГТООЛ

Үнэлгээний тайлангийн тухай

Symbol

PEOPLES KHURAL'S RESOLUTION OF MANDAAT BAG
ALDARKHAAN SOUM, ZAVKHAN AIMAG

2018 year 03 month 07 day   No. 02   Aldar

⌐ About assessment report ¬

Based on the Article 17.1.9 of Law of Mongolia on administrative and territorial units of Mongolia and their governance, Article 18.4 of Law of Mongolia on environmental impact assessments, Bahg's Peoples Khural has discussed and RESOLVED:

1. Support the "Sunny Trade" LLC's "Report of specified environmental assessment" of 5 MW solar power station project, which is financed by Asian Development Bank and will be built in territory Mandaat Bag, Aldarkhaan Soum.

2. Support the project to the Ministry of Environment and Tourism.

Govi Altai 10 MW Solar PV

Table 1: Original list of participants of a consultation meeting on environmental and social impact assessment of a proposed 10 MW solar power, Jargalant Bahg, Yesonbulag Soum, Govi-Altai Aimag, October 16th, 2017.

Table 2: Translated list of participants of a consultation meeting on environmental and social impact assessment of a proposed 10 MW solar power, Jargalant Bahg, Yesonbulag Soum, Govi-Altai Aimag, October 16th, 2017.

No.	Last name, Given name	Personal No.		No.	Last name, Given name	Personal No.
No.	Last name, Given name	Personal No.		36	Ts. Bayartsogt	UI 69111873
1	Sh. Sainbuyan	DYu 61100110		37	Kh. Agiimaa	DK 71120101
2	D. Erdenedalai	MS 73111716		38	P. Oyuntsetseg	DYu 66122803
3	N. Batbayar	DE 72011411		39	U. Sergelen	DA 84071302
4	L. Erdenepurev	SP 88121905		40	N. Munkhjargal	DE 59051130
5	E. Enkhbat	DE 85071319		41	M. Nyam-Ochir	DYu 88100974
6	B. Nyamdavaa	DYu 91090204		42	E. Davaajargal	DYu 88111481
7	D. Otgonbayar	DYu 77032918		43	D. Urangoo	DZ 81121107
8	T. Rentsenpurev	DG 84120613		44	N. Baatarsukh	DYu 65010814
9	T. Unurtsetseg	DYu 86051702		45	A. Amgalanbold	DD 85081812
10	Kh. Tsermaa	DE 52090309		46	Sh. Bat-Erdene	DYu 86093071
11	G. Sanchirmaa	DJ 95031100		47	R. Davaajargal	DYu 90012116

No.	Last name, Given name	Personal No.		No.	Last name, Given name	Personal No.
12	G. Altantsog	DE 83110215		48	B. Tumenjargal	DYu 94091130
13	I. Enkhtuya	DYu 68120301		49	T. Batchimeg	OE 80052961
14	Ts. Ariunjargal	DE 84060318		50	D. Myagmarsuren	DZ 78051403
15	S. Altantsetseg	DE 72010407		51	D. Altanugerel.	DE 84122915
16	G. Tsetsegmaa	DN 66010802		52	D. Erdenedalai	MS 73111716
17	U. Tungalagtamir	DG 01241301		53	N. Nasanbat	DL 79010915
18	A. Myagarjav	DM 01210211		54	S. Ganzorig	DE 63030117
19	G. Tsetsegsuren	ZZ 87120704		55	B. Jargalsaikhan	DYu 63042373
20	G. Bolormaa	DO 64022108		56	J. Mendbayar	DE 59050713
21	B. Oyunchimeg	DG 65082003		57	Ch. Altantsetseg	DYu 86121126
22	Sh. Nasan	DP 67041511		58	G. Nyamjargal	DD92092702
23	A. Purevsuren	DE 73032238		59	U. Tungalagtamir	DG 01241301
24	S. Saruulbuyan	Dyu 88050358		60	Sh. Sainbuyan	DYu 61100110
25	B. Oyunbileg	KhV 67010204		61	S. Ganzorig	DYe 75022719
26	Ts. Byaruuzana	DZ 85031515		62	Ch. Myadagbadam	DZ 77101006
27	P. Bumdelger	DG 83021905		63	D. Ariunjargal	DB 74090502
28	D. Chinbat	DYe 73080955				
29	L. Otgonjargal	DK 73120917				
30	Oyungerel	DYu 72080408				
31	Ch. Jargalsaikhan	DK 73010212				
32	G. Mendsaikhan	DYu 74081618				
33	D. Khurelbaatar	DYu 75092511				
34	Ts. Enkhmend	DYu 87042914				
35	D. Gankhulug	DYu 67112613				

Figure 1: Decision of the Namir Bahg's Peoples Khural of Umnugovi Soum, Uvs Aimag, supporting the subproject's environmental impact assessment and translation.

Symbol

RESOLUTION OF BAHG'S PEOPLES KHURAL
YESONBULAG SOUM'S JARGALANT BAHG,
GOVI-ALTAI AIMAG

2017 year 10 month 16 day	No. 1	Yesonbulag

About assessment report

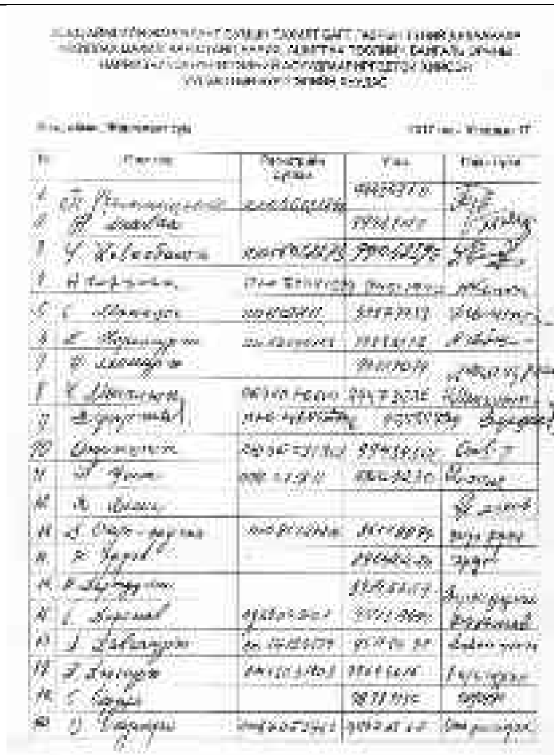
Based on the Article 17.1.9 of Law of Mongolia on administrative and territorial units of Mongolia and their governance, Article 18.4 of Law of Mongolia on environmental impact assessments, Bahg's Peoples Khural has discussed and RESOLVED:

1. Support the "Sunny Trade" LLC's "Report of specified environmental assessment" of Solar Station project, which is financed by Asian Development Bank and will be built in territory Jargalant Bahg, Yesonbulag soum.

2. Deliver the report to Ministry of Environment and Tourism

Khovd Shallow-ground Heat Pump

Table 1: Original list of participants of a consultation meeting on environmental and social impact assessment of a proposed Shallow-ground heat pump, Takhilt Bahg, Jargalant Soum/Khovd City, Khovd Aimag, October 17th, 2017.



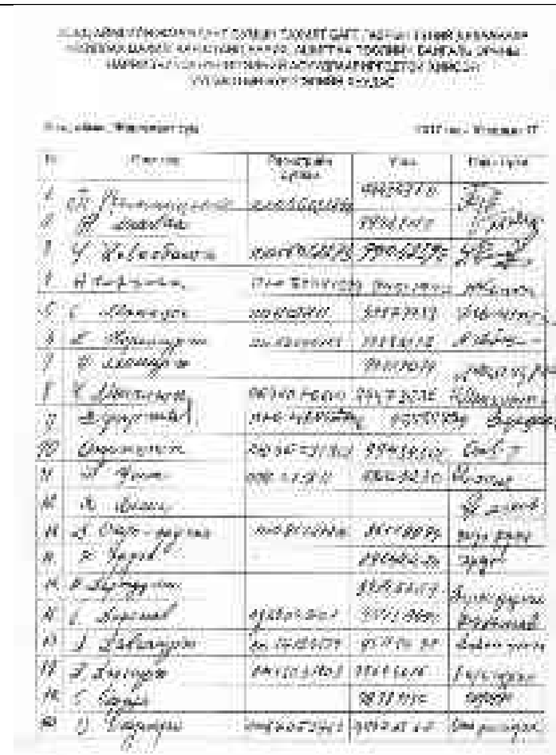


Table 2: Translated list of participants of a consultation meeting on environmental and social impact assessment of a proposed Shallow-ground heat pump, Takhilt Bahg, Jargalant Soum/Khovd City, Khovd Aimag, October 17th, 2017.

No.	Last name, Given name	Personal No.		No.	Last name, Given name	Personal No.
1	P. Tsagaantsooj	PYu 55031896		28	Gantumur	DYu 83102607
2	N. Lhagvaa			29	D. Munkhjargal	PM 89091322
3	Ch. Khuvuuboshgo	PYu 56032273		30	O. Tsetsegjargal	PM 86020603
4	N. Khartsaga	PYu 59021599		31	B. Oyun-Erdene	PI 94081118
5	S. Munkhtsog	PYu 61021111		32	B. Zoljargal	PV 94042008
6	N. Khorolsuren	PYu 62040163		33	M. Ulziijargal	ID 85073004
7	Ch. Lhamsuren			34	Purevkhuu	PP 87090100
8	Ch. Munkhtsetseg	OYu 82070600		35	Undrakh	PJ 64112401
9	Dugerjav	PYu 48052706		36	D. Nyamtsetseg	PYu 84111166
10	Oyuntsetseg	PYu 60031301		37	D. Nyamsuren	PYu 79093024
11	D.Tsooj	PE 47031811		38	S. Dejeddulam	KhL 55122501
12	Ya. Yampil			39	P. Erdenechimeg	PJ 72011901
13	D. Oyun-Erdene	PYu 85121906		40	D. Myagmarjav	PJ 92012915
14	R. Erdev			41	Anu	
15	M. Dorjdulam			42	Tuguldur	
16	Ye. Darijav	PZ 56042101		43	Anirmaa	
17	L. Davaasuren	PYu 57120567		44	J. Amaraa	JYu 80071889
18	D. Darisuren	PJ 63091803		45	Ts. Dagva	PYu 59071920
19	S.Saruul			46	Kh. Tselmeg	PYu 83112014
20	O. Oyungerel	PYu 67052768		47	B. Enkhdulam	OI 90043008
21	I. Munkhtsetseg	PJ 72021516		48	Erdenetsogt	
22	Ch. Ariunaa	PM 86122503		49	Kh. Davaajav	
23	B. Batsaikhan	PYu 56050670		50	Kh. Jigdbayar	OG 87122526
24	B. Mashtsetseg	PYu 88050104		51	T. Oyuntsetseg	
25	S. Erdene-Ochir	PYa 62041012		52	S. Nansalmaa	PI 73101008
26	Purevsuren	PV 65033010		53	S. Oyun-Erdene	PJ 86030701
27	Tavintai	PV 80121414		54	D. Narantsetseg	PI 87091861

Figure 1: Decision of the Takhil Bahg's Peoples Khural of Jargalant Soum/Khovd City, Khovd Aimag, supporting the subproject's environmental impact assessment and translation.

ХОВД АЙМАГ
ЖАРГАЛАНТ СУМЫН
ТАХИЛТ БАГИЙН ИРГЭДИЙН НИЙТИЙН
ХУРЛЫН ТОГТООЛ

Жаргалант

Н.ХОРОЛСҮРЭН

Symbol

RESOLUTION OF BAHG'S PEOPLES KHURAL
JARGALANT SOUM'S TAKHILT BAHG,
GOVI-ALTAI AIMAG

2017 year 10 month 17 day   No. 01   Jargalant

About assessment report

Based on the Article 17.1.9 of Law of Mongolia on administrative and territorial units of Mongolia and their governance, Article 18.4 of Law of Mongolia on environmental impact assessments, Bahg's Peoples Khural has discussed and RESOLVED:

ONE: Support the "Sunny Trade" LLC's "Report of specified environmental assessment" of Heat Pump using a Shallow-ground project, which is financed by Asian Development Bank and will be built in territory Takhilt Bahg, Jargalant soum.

TWO: Deliver the report to Ministry of Environment and Tourism

CHAIRMAN *signature* N. KHOROLSUREN
stamp

APPENDIX IX: ENVIRONMENTAL MONITORING REPORT TEMPLATE

Environmental Monitoring Report

Semi-annual Report
{Month Year}

MON: Upscaling Renewable Sector Project ({Subproject name})

Prepared by the Ministry of Energy for the Asian Development Bank for the Asian Development Bank.

CURRENCY EQUIVALENTS
(as of {Day Month Year})

Currency unit	–	Mongolian Tughrik
MNT1.00	=	$
$1.00	=	MNT

ABBREVIATIONS

WEIGHTS AND MEASURES

NOTES

(i) The fiscal year (FY) of the Ministry of Energy ends on 31 December.

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

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APPENDIX X: LAND CLEARANCE LETTERS FROM LOCAL GOVERNMENT

ГОВЬ-АЛТАЙ АЙМГИЙН
АЛТАЙ СУМЫН ЗАСАГ ДАРГА
82130 Бигэр-Оорд, Алтай сум
Утас: 70-48-71-34
2018-04-27 № 01/21

АЗИЙН ХӨГЖЛИЙН БАНКНЫ
БАРУУН БҮСИЙН СЭРГЭЭГДЭХ
ЭРЧИМ ХҮЧИЙГ НЭМЭГДҮҮЛЭХ
ТӨСЛИЙН НИЙГМИЙН ХАМГААЛАЛ
ШИНЖИЛГЭЭ ХАРИУЦСАН
МЭРГЭЖИЛТЭН Б.БИЛГҮҮН ТАНАА

Нүүлгэн шилжүүлэлтийн нөхцөл байдлын тухай

Танд энэ өдрийн мэнд хүргэе мэндчилье.

Азийн хөгжлийн банкны санхүүжилтээр хэрэгжиж Сэргээгдэх Эрчим хүчийг нэмэгдүүлэх төслийн хүрээнд Говь-Алтай аймгийн Алтай сумын нутаг дэвсгэрт салхин цахилгаан станц барихаар болсон.

Төслийн хэрэгцээгээр сонгогдсон газар нь иргэд, хуулийн этгээд албан байгууллагын эзэмшилд байхгүй болно.

Иймд газар болон ус [illegible] чөлөөлүүлэх нүүлгэн шилжүүлэх шаардлагагүй болохыг тус сумын Засаг даргын Тамгын газрын [illegible] үүгээр баталгаажуулан хүргүүлж байна.

Д.ЦЭРЭНСАМБУУ

010000040

THE GOVERNOR OF ALTAI SOUM
GOBI-ALTAI PROVINCE
Date : April 27, 2018 No. 01/21

TO: B.BILGUUN, THE NATIONAL SOCIAL SAFEGUARDS AND ANALYSIS EXPERT OF ASIAN DEVELOPMENT BANK PROJECT: SCALING-UP RENEWABLE ENERGY IN WESTERN REGION.

On resettlement matter

How do you do, Sir.

The Wind power station is going to be built in in the vicinity of Altai soum of Gobi-Altai aimag as a part of the Scaling-up Renewable Energy project financed by the Asian Development Bank.
The selected site has not been possessed or owned by individuals, private sectors and other legal entities.

Therefore, The Governor Office certifies with this official letter that the selected site land is owned by the Government and there are no needs for land acquisition, human and property resettlement.

THE GOVERNOR D.TSERENSAMBUU

010000043

ГОВЬ-АЛТАЙ АЙМГИЙН
ЕСӨНБУЛАГ СУМЫН ЗАСАГ ДАРГЫН
ТАМГЫН ГАЗАР

[illegible]

2018.05.04 № 1/90

Таны ______ -ны № ______

АЗИЙН ХӨГЖЛИЙН БАНКНЫ БАРУУН БҮСИЙН СЭРГЭЭГДЭХ ЭРЧИМ ХҮЧИЙГ НЭМЭГДҮҮЛЭХ ТТ 9224 МОН ТӨСЛИЙН НИЙГМИЙН ХАМГААЛАЛ ШИНЖИЛГЭЭ ХАРИУЦСАН МЭРГЭЖИЛТЭН Б.БИЛГҮҮН ТАНАА

Нүүлгэн шилжүүлэлтийн тухай

Азийн хөгжлийн банкны санхүүжилтээр хэрэгжих Нарны цахилгаан станц буюу Сэргээгдэх эрчим хүчийг нэмэгдүүлэх төслийн хүрээнд Говь-Алтай аймгийн Есөнбулаг сумын нутаг дэвсгэр Жаргалант багийн хадаасангийн аарагт 10 МВт-ын хүчин чадал бүхий нарны цахилгаан станц барихаар болсон.

Төслийн зорилгоор сонгосон Хадаасангийн аарагт байрлах газарт иргэд, хувийн хэвшил, албан байгууллага болон эд хөрөнгийг чөлөөлж, нүүлгэн шилжүүлэх шаардлагагүй болохыг Есөнбулаг сумын Засаг даргын Тамгын газрын зүгээс үүгээр баталгаажуулан мэдэгдэж байна.

ДАРГЫН ҮҮРГИЙГ ТҮР ОРЛОН
ГҮЙЦЭТГЭГЧ Д.ЭНХЧИМЭГ

07 0013

THE GOVERNOR OFFICE
OF YESUNBULAG SOUM
GOBI-ALTAI PROVINCE
Date : May 4, 2018 No. 3/90

On resettlement matter

TO: B.BILGUUN, THE NATIONAL SOCIAL SAFEGUARDS AND ANALYSIS EXPERT FOR ASIAN DEVELOPMENT BANK PROJECT: SCALING-UP RENEWABLE ENERGY IN WESTERN REGION.

10 MWt solar power station is going to be built in Khadaasangiin Aarag area of Jargalan bag in the vicinity of Yesunbulag soum of Gobi-Altai aimag by the Asian Development Bank project of Scaling-up Renewable Energy in western region.

The Governor Office of Yesunbulag soum certifies with this letter that the selected land is state property and there is no need for human and private sector and public property resettlements in selected area of Khadaasangiin Aarag.

THE ACTING GOVERNOR D.ENKHCHIMEG

07 0013

ХОВД АЙМАГ
ЖАРГАЛАНТ СУМЫН
ЗАСАГ ДАРГЫН ТАМГЫН ГАЗАР
84140 Ховд, Жаргалант сум, Ховд аймаг
Утас: 7043-5212

[illegible] № [illegible]

танай ________ -ны № ________ -т

АЗИЙН ХӨГЖЛИЙН БАНКНЫ
БАРУУН БҮСИЙН СЭРГЭЭГДЭХ
ЭРЧИМ ХҮЧИЙГ НЭМЭГДҮҮЛЭХ
ТӨСӨЛД

Жаргалант сумын нутаг дэвсгэрт шинээр баригдсан 1 дүгээр цэцэрлэгийн халаалтыг Азийн хөгжлийн банкны санхүүжилтээр газрын гүний дулааны насос бүхий технологи нэвтрүүлэхээр болсон юм.

Тус 1 дүгээр цэцэрлэг нь 3000мкв талбай бүхий газар эзэмшдэг ба газрын гүний дулааны насос бүхий технологийг суурилуулах ажил гүйцэтгэхэд аж ахуйн нэгж, иргэд, албан байгууллагатай холбогдол бүхий газрын маргаан, хүний болон эд хөрөнгийн нүүлгэн шилжүүлэлт шаардлагагүй болохыг сумын Засаг даргын Тамгын газрын зүгээс баталгаажуулан хүргүүлж байна.

ТАМГЫН ГАЗРЫН ДАРГЫН ҮҮРГИЙГ
ТҮР ОРЛОН ГҮЙЦЭТГЭГЧ, МЗҮ-ИЙН
ТАСГИЙН ДАРГА Ц.НАНЖИД

THE GOVERNOR OFFICE
OF JARGALAN SOUM
KHOVD PROVINCE
Date : May 3, 2018 No. 2/265

TO: THE ASIAN DEVELOPMENT BANK PROJECT: SCALNG-UP RENEWABLE ENERGY IN WESTERN REGION

The Asian Development Bank is going to introduce a Shallow-ground heat pump technology in the Kindergarten No.1 which was newly built in the vicinity of Jargalan soum.

The state owned kindergarten No.1 possesses a land of 3000m^2. With this letter The Governor Office certifies that the selected site land is Government property and land acquisition, and human and property resettlements are not required to install the Shallow-ground heat pump technology in Kindergarten No.1.

.

ACTING GOVERNOR AND VETERINARY FINANCE DEPARTMENT DIRECTOR TS.NANJID

ЗАВХАН АЙМГИЙН
АЛДАРХААН СУМЫН ЗАСАГ ДАРГА
81000 Алдар, Алдархаан сум

2018.04.27 № 01/90

АЗИЙН ХӨГЖЛИЙН БАНКНЫ БАРУУН БҮСИЙН СЭРГЭЭГДЭХ ЭРЧИМ ХҮЧИЙГ НЭМЭГДҮҮЛЭХ ТТ 9224 МОН ТӨСЛИЙН НИЙГМИЙН ХАМГААЛАЛ, ШИНЖИЛГЭЭ ХАРИУЦСАН МЭРГЭЖИЛТЭН Б.БИЛГҮҮН ТАНАА

Нүүлгэн шилжүүлэлтийн тухай

Азийн хөгжлийн банкны санхүүжилтээр хэрэгжих Нарны цахилгаан станц буюу Сэргээгдэх эрчим хүчийг нэмэгдүүлэх төслийн хүрээнд Завхан аймгийн Алдархаан сумын нутаг дэвсгэр Мандаат багийн Цагаан толгойн ойролцоох газарт 5 МВт-ын хүчин чадал бүхий Нарны цахилгаан станц барихаар болсон.

Төслийн зорилгоор сонгосон Цагаан толгойн ойролцоох газарт иргэд, хувийн хэвшил, албан байгууллага болон эд хөрөнгийг чөлөөлж, нүүлгэн шилжүүлэх шаардлагагүй болохыг Алдархаан сумын Засаг даргын Тамгын газрын зүгээс үүгээр баталгаажуулан мэдэгдэж байна.

ДАРГА Б.БАТДЭЛГЭР

Албан бланк-2018

440014

THE GOVERNOR OF ALDARKHAAN SOUM
ZAVKHAN PROVINCE
Date : April 27, 2018 No. 01/90

TO: B.BILGUUN, THE NATIONAL SOCIAL SAFEGUARDS AND ANALYSIS EXPERT FOR ASIAN DEVELOPMENT BANK PROJECT: SCALING-UP RENEWABLE ENERGY IN WESTERN REGION.

On resettlement matter

5MWt solar power station is going to be built in the vicinity of Aldarkhaan soum of Zavkhan aimag, near Tsagaan Tolgoi (name of place) of Mandaat bag as a core project of the Scaling-up Renewable Energy Project financed by the Asian Development Bank.

Herewith, The Governor Office of Aldarkhaan soum certifies with this letter that the selected land is the state property and there is no need for human and private sector and public property resettlements in selected area of Tsagaan tolgoi.

THE GOVERNOR B.BATDELGER

Official letter 2018
440014

УВС АЙМАГ
ӨМНӨГОВЬ СУМЫН ЗАСАГ
ДАРГА
213410, Өмнөговь сум, Наран
Утас: 70456291

2012.04.25 № 64
танай ________-ны № ________-т

АЗИЙН ХӨГЖЛИЙН БАНКНЫ БАРУУН БҮСИЙН СЭРГЭЭГДЭХ ЭРЧИМ ХҮЧИЙГ НЭМЭГДҮҮЛЭХ ТТ 9224 МОН ТӨСЛИЙН НИЙГМИЙН ХАМГААЛАЛ,ШИНЖИЛГЭЭ ХАРИУЦСАН МЭРГЭЖИЛТЭНБ. БИЛГҮҮН ТАНАА

Нүүлгэн шилжүүлэлтийн нөхцөл байдлын тухай

Азийн хөгжлийн банкны санхүүжилттэй хэрэгжих Сэргээгдэх эрчим хүчийг нэмэгдүүлэх төслийн хүрээнд Увс аймгийн Өмнөговь сумын нутаг дэвсгэрт 10 МВт-ын хүчин чадал бүхий Салхин цахилгаан станц барихаар болсон.

Төслийн зорилгоор сонгосон баруун хөдөө гэдэг газар нь иргэд, хувийн хэвшил, албан байгууллагын газар болон эд хөрөнгийг чөлөөлж, нүүлгэн шилжүүлэх шаардлагагүй болохыг Өмнөговь сумын засаг даргын тамгын газрын зүгээс үүгээр баталгаажуулан мэдэгдэж байна .

ДАРГА Р.ТӨМӨРЧӨДӨР

THE GOVERNOR OF UMNUGOBI SOUM
UVS PROVINCE
Date : April 25, 2018 No. 64

TO: B.BILGUUN, THE NATIONAL SOCIAL SAFEGUARDS AND ANALYSIS EXPERT FOR ASIAN DEVELOPMENT BANK PROJECT: SCALING-UP RENEWABLE ENERGY IN WESTERN REGION.

On resettlement matter

10 MWt Wind power station is going to be built in Umnugobi soum of Uvs aimag as a part of the Scaling-up Renewable Energy project financed by the Asian Development Bank.

Herewith, Umnugobi Soum Governor Office certifies with this letter that the selected land for the project purposes is the state property and there is no need for human and private sector and public property resettlements in the selected area of Baruun Khuduu.

THE GOVERNOR R.TUMURCHUDUR

THE GOVERNOR OF ALTAI SOUM
GOBI-ALTAI PROVINCE

Date : April 27, 2018 No. 01/21

TO: B.BILGUUN, THE NATIONAL SOCIAL SAFEGUARDS AND ANALYSIS EXPERT OF ASIAN DEVELOPMENT BANK PROJECT: SCALNG-UP RENEWABLE ENERGY IN WESTERN REGION.

On resettlement matter

How do you do, Sir.

The Wind power station is going to be built in in the vicinity of Altai soum of Gobi-Altai aimag as a part of the Scaling-up Renewable Energy project financed by the Asian Development Bank.

The selected site has not been possessed or owned by individuals, private sectors and other legal entities.

Therefore, The Governor Office certifies with this official letter that the selected site land is owned by the Government and there are no needs for land acquisition, human and property resettlement.

THE GOVERNOR D.TSERENSAMBUU

010000043